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For related information see also *Astronautics*.

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VOLUME 18 NUMBER 5/MARCH 8, 1980

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 553

02 AERODYNAMICS 556

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

03 AIR TRANSPORTATION AND SAFETY 559

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 559

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 565

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 566

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 567

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL 569

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 571

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*.

12 ASTRONAUTICS (GENERAL) 572

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS 573

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES 574

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 575

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 576

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 576

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION N.A.
For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 577
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.
For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

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23 CHEMISTRY AND MATERIALS (GENERAL) N.A.
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 578
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 579
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 582
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 585
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 586
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics*.

31 ENGINEERING (GENERAL) 588
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 589
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 596
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 599
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 601
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 603
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 605
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 606
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 606
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 608
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 615
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *85 Urban Technology and Transportation*.

45 ENVIRONMENT POLLUTION 628
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 631
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY 634
Includes weather forecasting and modification.

48 OCEANOGRAPHY 638
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 639
Includes genetics.

52 AEROSPACE MEDICINE 641
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES 643
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT 646
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 652
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE 653
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS 657
Includes computer networks.

63 CYBERNETICS 657
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS 658
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY 660
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS 661
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS 662
Includes topology and number theory.

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Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering*.

70 PHYSICS (GENERAL) 662
For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar Physics*.

71 ACOUSTICS 662
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS 668
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 669
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 670
Includes light phenomena.

75 PLASMA PHYSICS 672
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 674
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS 677
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) 678
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT 678
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 679
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 680
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 680
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) 681

89 ASTRONOMY 683
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 684
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 685
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 686
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 687
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

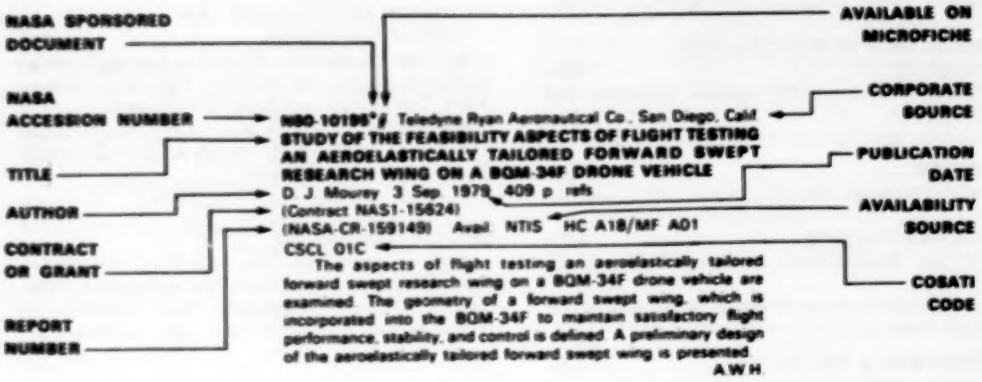
GENERAL

99 GENERAL 688

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-51
CORPORATE SOURCE INDEX I-57
CONTRACT NUMBER INDEX I-71
REPORT/ACCESSION NUMBER INDEX I-75

TYPICAL CITATION AND ABSTRACT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TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
PUBLICATION DATE
AUTHOR
D. J. Mourey. 3 Sep. 1979. 409 p. refs
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The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, SOLID PROPELLANT ROCKET MOTOR INTERNAL BALLISTIC PERFORMANCE VARIATION ANALYSIS

R.H. Sforzini, Auburn University, School of Engineering, Dept. of Aerospace Engineering, *Auburn, Alabama* 36830 (NCA 8-130)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

1.0002, ANGULAR VIBRATION OF AIRCRAFT

W. Gibson, Anamet Lab. Inc., *Berkeley, California* (DF139980; F33615-77-C-3050)

Vibration adversely affects the performance of airborne optical systems which require high pointing accuracy. Aircraft structural vibrations are composed of linear and angular motions. Little is known of the latter and therefore the allowable angular motions among components of airborne optical systems in the low microradian range are difficult to define. To design such systems to operate with optimum performance and reliability requires the accurate prediction of angular vibrations. The objective of this work is to generate forced response prediction techniques for angular vibrations and to verify their accuracy with experimental data.

Techniques are available for estimating the low and high frequency forced linear vibration response of aircraft. Such techniques shall be considered for their limitations, flexibility and subsequent modifications resulting in angular vibration predictions. Unique combinations of these prediction techniques by optimizating their capabilities will also be examined to provide overall improvement in reliability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0003, STUDY TURBULENCE STRUCTURE

A. Demetriades, Ford Aerospace & Communications Corp., Aeronutronic Division, *Ford Rd., Newport Beach, California* 92663 (DF139560; F33615-77-C-3016)

The function of this program is to acquire detailed measurements of turbulent fluctuation properties and Reynolds stress under adverse pressure gradient. This effort is designed to improve the computational accuracy for turbulent flows on aerospace vehicles. Many of the Air Force current aerodynamic problems can be traced back to a lack of understanding of the fundamentals of turbulence. The technical objective is to systematically investigate the turbulence structure under adverse pressure gradients and to obtain the variation of Reynolds stress distribution under these conditions. The program's payoff to the Air Force will be the ability to predict turbulent boundary layer phenomena on supersonic aircraft.

The turbulent fluctuations will be measured experimentally by means of a hot wire anemometer and a laser Doppler velocimeter on a boundary layer over a curved ramp. Correlation of these measurements will be carried out to obtain Reynolds stresses. The final product shall be the variation of Reynolds stress distribution with pressure gradient.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0004, NEW STRATEGIC AIRLIFT CONCEPTS

F. Newton, McDonnell Douglas Corp., *3855 Lakewood Blvd., Long Beach, California* 90808 (DF142580; F33615-78-C-3017)

An analysis of a future conflict between NATO and Warsaw Pact forces indicates intense fighting, with corresponding rapid consumption of military equipment. This equipment must be replaced, and supplemented, at a rate possible only with rapid airlift. This scenario is the consequence of the increasing size of the Warsaw Pact forces, and it places demand on MAC and the strategic airlift resources, which may require the design of a new AF cargo aircraft. The AFFDL has the responsibility to conduct design integration studies and technology development for future systems. A conceptual design program will be conducted to determine the feasibility of new strategic airlift aircraft.

A contractor shall conduct a design integration study within the context of a scenario involving airlift to NATO forces. The design requirements will incorporate the findings of the massive rapid resupply study contracts presently being performed. The analysis will define the vehicle in terms of range, payload, speed and related parameters, as well as force size, maintenance requirements, interface with Army equipment, and similar support requirements. The payload requirements will reflect projections of future Army weapons specifically designed for the intense NATO conflict. The findings from this study will be suitable for specifying future technology requirements.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0005, DESIGN ASSESSMENT OF ADVANCED TECHNOLOGY, LIGHTWEIGHT, LOW-COST MISSION CONFIGURED GONDOLA MODULES

J. Porterfield, Kaman Aerospace Corp., *Old Windsor Rd., Bloomfield, Connecticut* 06002 (DA0E3839; DAAK51 78 C 0012)

To perform design trade-off analyses in conjunction with the assessment of advanced technology materials (metallic and non-metallic composites) and effective structural arrangements and provide preliminary designs and critical item development specification (CIDS) for a lightweight, low-cost system of gondolas.

Under prior R & D effort two experimental gondola systems were designed and fabricated. Operational suitability testing demonstrated the technical feasibility of the gondola concept and identified configuration and technological improvements essential to combat and combat service support missions. Current effort will perform design trade-off analyses for candidate advanced technology materials and structural arrangements and provide preliminary design and CIDS for a lightweight, low-cost, efficient gondola system. Follow-up effort will consist of detailed design of technology demonstrator gondola modules, fabrication, static testing and flight evaluation.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0006, ANALYSIS OF FLOWS WITH SHOCKS
D.A. Anderson, Iowa State University of Science & Technology, School of Engineering, Dept. of Aerospace Engineering, *496 Town Engineering Bldg., Ames, Iowa* 50011 (NCC 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0007, MARITIME PATROL AIRSHIP STUDY
R.B. Levitt, Summit Research Corp., *1 W. Deer Park Rd., Gaithersburg, Maryland* 20760 (DN981125; N62269-78-RC-00021)

Establish methodology for a missions math model based on Coast Guard mission requirements. In support of work unit No. DH814 and Agency Accession No. 881665.

Based on Coast Guard mission experience construct and operate a computer math model to conduct missions analyses.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0008, AVIATION AUTOMATIC WEATHER OBSERVING SYSTEMS (AV-AWOS)
J.A. Cunningham, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Equipment Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (RD590713)

OBJECTIVE: To enhance AV-AWOS by adding and evaluating an improved thunderstorm detector and a laser present weather system.

APPROACH: 1. Completion of the AV-AWOS procurement specifications for the FAA. 2. Completion of report on AV-AWOS operational test at Patrick Henry Airport. 3. Design, development and testing of interface and software of FAA furnished thunderstorm detector for AV-AWOS enhancement. 4. Design, develop and test laser present weather system for AV-AWOS.

PROGRESS: The AV-AWOS system has been returned from the test area. The basic control system is being reinstalled at T&ED Sterling, Va. to be used in testing new sensors.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin., Systems Research & Development Service

1.0009, HELICOPTER IR RADIATION PREDICTION (SPRITE, MOD)
R. Wilton, General Electric Co., Aircraft Engine Group, *1000 Western Ave., East Lynn, Massachusetts* 01910 (DA0E3866; DAAK51 79 C 0012)

Improvement of Army's spectral plume radiation intensity target evaluation (SPRITE) computer program to include helicopter aircraft modeling, missile lock-on range, and more efficient computer predictions.

SPRITE will be expanded to provide helicopter airframe modeling and missile lock-on range predictions. The hot metal prediction modules will be revised to provide more efficient programing and computer core time.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0010, ADVANCED COMPOSITE CENTER FUSELAGE STRUCTURE DEVELOPMENT
L. Murrin, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN981065; N62269-78-C-0017)

The design and development of advanced composite center fuselage types of construction which can satisfy the configuration and structural loading requirements of future naval aircraft, and the fabrication of critical structural subcomponent test specimens.

This is an eighteen month program consisting of two phases. In phase I the basic preliminary design will be performed including definition of materials, material combinations, material forms, type of construction, method of fabrication and realistic cost impact. Element and coupon tests will be performed. The second phase will consist of prototype design and the design and fabrication of a critical subcomponent, and the preparation of detailed tests plans for this subcomponent.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0011, TURBULENCE STUDY
J.K. Luers, University of Dayton, Research Inst., *300 College Park Ave., Dayton, Ohio* 45469 (NAS 8-32111)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

1.0012, ELECTROMAGNETIC AND ELECTROSTATIC EFFECTS ON COMPOSITE MATERIALS
R. Lane, U.S. Dept. of Defense, Navy, Naval Air Development Center, Systems Directorate, *Warminster, Pennsylvania* 18974 (DN881505)

To develop and demonstrate ground and flight test facilities which support existing system analysis of the electromagnetic compatibility of composite material aircraft.

NADC will assist NavAirSysCom with technical liaison/coordination; develop lightning specifications; determine the accuracy of the Boeing lightning analysis by comparing this analysis with F18, Culham laboratory and NavAirTestCen measurements; participate in composite metal joint investigation bimonthly review meetings; monitor the Boeing metal graphite/epoxy measuring instrumentation contract; and perform system analysis for composite aircraft in 1995 environments in concert with other efforts.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Systems Command, Command Control & Guidance Admin.

1.0013, HT 74-14- BALLISTIC TESTING, ARMY AIRCREW AND CRITICAL COMPONENT PROTECTIVE DEVICES
C.M. Pedriani, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Air Mobility Research & Development Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0D3912)

To provide ballistic testing of critical component and aircrew protective devices and to validate design criteria that increase the ballistic survivability of Army aircraft.

To conduct experimental firing programs in conjunction with design, fabrication, and ballistic tests to evaluate: (1) fuel fog inerting concepts to reduce inflight fuel fires in helicopters; (2) fuel tank materials to increase the survivability of the AH-1G to 14.5mm API projectiles; (3) fuel tank materials to increase the survivability of the AH-1G to 23mm HEI projectiles; (4) ballistic tolerant drive shafts/aircrew transparent and opaque armor upgrade; (5) support of other area missions (e.g., aircraft structures and flight controls); (6) miscellaneous support (e.g., installation, test, and evaluation UTTAS and HLH).

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0014, ADVANCED BRAKE CONTROL SYSTEM
S.M. Warren, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF141220; F33615-78-C-3408)

The level of USAF combat effectiveness depends in part on the capability of its aircraft to land during adverse weather conditions. Assuming that a controlled approach is possible, landing capability is further limited by lack of directional and braking control on the runway. The objective of this effort is to model and analyze an autonatic landing control system that will make maximum use of available forces to successfully conclude the landing process once the aircraft has touched down. Such a system will reduce off-runway incidents and extend all weather landing capability for USAF aircraft.

A government-owned computer program for aircraft landing simulation will be modified to include more sophisticated landing gear and runway models. An automatic control system will also be included in the modified program. Computer simu-

lations will be run to show system effectiveness under adverse conditions. Subsequently, the models will be installed on an AF motion base simulator, which is coupled with existing aircraft hardware, and evaluated against pilot performance. A preliminary design and criteria will be prepared.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, AN INVESTIGATION OF TOXIC HAZARDS FROM BURNING MATERIALS IN CONTROLLED FIRES
Unknown, California State University & Colleges, San Jose State University, Graduate School, *Washington Sq., San Jose, California* 95192 (NCC 2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0002, COMPOSITE MATERIAL E3
S. Jauregui, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN998066)

To support the NavAir program of electromagnetic systems design of advanced composite material aircraft.

Participate in AV8B composite wing EM tests and reduce data from tests. Analyze results of Porter P-static flight tests and identify areas of importance for continuation of experiments. Improve the performance and calibration of broadband omnidirectional EM field probes. Identify, demonstrate and recommend EM testing technology for composite aircraft sections which will produce needed improvements below 2 MHz.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0003, HYDROCARBON LOW TEMPERATURE VISCOSITY
C.T. Moynihan, Catholic University of America, School of Engineering & Architecture, Dept. of Materials Science, *620 Michigan Ave. N.E., Washington, District of Columbia* 20017 (DN890105; N00019-78-C-0366)

One problem with the jet fuels derived from alternative energy sources such as shale oil and coal is expected to be the deleterious effect of an N-alkane content higher than present from petroleum sources. This program will study the freezing point and viscosity behavior at low temperature of mixtures of kerosene jet fuel hydrocarbon mixtures as a function of temperature and composition.

The viscosities (and densities) of the pure jet fuel type components will be measured over the temperature -60 to 50 degrees C and the data will be computer-fitted to deduce empirical equations for these hydrocarbons. The relationship between molecular shape and structure on the viscosity is to be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0004, THEORETICAL STUDIES IN CHEMISTRY
K.F. Freed, University of Chicago, School of Physical Sciences, Dept. of Chemistry, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (CHE75-01549 A03)

Professor Freed is developing theories and theoretical methods to further understanding of a number of important chemical problems in the areas of photochemical reaction dynamics, molecular relaxation processes, and the electronic structure of atoms and molecules. The research work includes the following projects: Development of a theory of the photodissociation processes of triatomic molecules which provides the wavelength dependence of the fragment vibrational, rotational, and translational energy distribution. Research on a Franck-Condon description of collinear chemical reactions. Further development of Freed's previous theory of collision-induced intersystem crossing, to consider the contribution to crossing rates from individual collisional processes, as well as the dependence of these rates on the intermolecular potentials. Consideration of a theory of vibrational relaxation of molecules in condensed media, to determine the nature of the various T1, T2, and coherence transfer processes that can arise. Development of a fully quantum-mechanical theory of the time-independent Green's function for molecules in coherent radiation fields. Critical assessment of many-body Green's function-equations of motion methods, to determine their accuracy and value in the prediction of ionization potentials, electron affinities and X-ray photoelectron spectra. Research on effective Hamiltonian theories, to examine the contribution of nonclassical effects to atomic and molecular electronic structure. This is a renewal of grant CHE-7501549.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0005, DENSITY FUNCTIONAL THEORY OF METALS AND METAL SURFACES
J.P. Perdew, Tulane University of Louisiana, Graduate School, *New Orleans, Louisiana* 70118 (DMR78-12398)

Theoretical research in metal physics will be carried out using the density functional theory of the inhomogeneous interacting electron gas. This method will be used to investigate the face-dependence of the metallic surface energy, work functions, lattice relaxation at a surface and the surface plasmon dispersion. Also, a variational study will be made of the relative stabilities of the paramagnetic state and the spin-and charge-density waves in metals. In addition, extensions of the theory will be developed, by adding the effects of local pseudopotentials and the exchange corrections to the random phase approximation.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0006, ADVANCED PROCESSING OF MAGNESIUM ALLOYS
M. Kumar, U.S. Dept. of Defense, Army, Armament Research & Development Command, Fire Control & Small Caliber Weapon Systems Lab., *Picatinny Arsenal, Dover, New Jersey* 07801 (DA0B0678)

The overall objective is to improve the formability and toughness of magnesium alloys through the use of advanced processing techniques. In FY79, the superplastic characteristic of wrought magnesium alloys will be investigated. This work is directed towards the technology area of aircraft with a major thrust of skins/structures/components.

In FY79, work will be directed towards investigating the superplastic forming of magnesium alloys. This work will involve documenting those parameters necessary to achieve superplastic flow. The parameters to be investigated are grain size, deformation temperature and strain rates. Selected commerical alloys will be evaluated. The grain size will be varied by thermal-mechanical processing. Tensile specimens will be tested at different temperatures and strain rates.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Fire Control & Small Caliber Weapon Systems Lab.

3.0007, MOLECULAR DYNAMICS IN CONDENSED MEDIA
B.J. Berne, Columbia University, School of Arts & Sciences, Dept. of Chemistry, *Broadway & W. 116th St., New York, New York* 10027 (CHE79-07820)

This grant supports research under the Structural Chemistry and Thermodynamics Program for computer simulation of systems with interesting physical and chemical properties. Professor Berne will develop new methodology for handling the following problems: 1. solvent effects on conformational equilibria, 2. solvent effects on the rates of chemical reactions, 3. the behavior of electrons in liquids, 4. nucleation freezing and surface properties of pure fluids and mixtures, and 5. interfacial phenomena in aqueous solutions. It is expected that this program will illustrate clearly how modern technology (i.e., the array processor) can be expected to provide a more detailed un-

derstanding of the liquid state phenomena. It is also anticipated that the development of efficient computer codes will favorably impact further utilization of array processors in many research areas, including process control.

This research is a continuation of that currently supported by Foundation Grant, CHE7611002.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0008, STUDIES IN DEFORMATION AND FRACTURE 16361-MS

C.R. Manning, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Materials Engineering, *Raleigh, North Carolina* 27607 (DA0G8902; DAAG29-78-G-0202)

The research will include: (1) a study of localized deformation and fracture in polymeric materials, with concentration on modification of existing deformation models to take into account the local structural and compositional factors that govern localized flow. (2) study of the relation of structural factors of polymeric foams to crack propagation in fatigue. (3) determination of the corrosion-fatigue behavior of metal-matrix composites. Relevance - structural foams are planned for Army applications such as vibrational and shock damping in a wide variety of vehicular structures. The establishment of foam structure and its relation to dynamic mechanical properties of foams is essential to this work. Metal-matrix composites are planned for a variety of structural applications in bridging and helicopters.

(1) Molecular weight and crystallinity determinations in localized deformation regions will assist in establishing new heat transfer parameters and a basis for modification of existing deformation models. (2) Stereological studies of cellular structures in various types and densities of polymeric foams will be used as base-lines for determining preferred crack paths in fatigue. (3) The corrosion fatigue behavior, as expressed by S-N and DA/DN data will be developed for various classes of AL/G and other systems to determine the roles of environment, stress level, and other factors in fatigue crack resistance.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0009, COMPOSITE SPECIMEN FABRICATION AND TEST

R.T. Achard, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF139700)

This work unit is supportive to preliminary design and evaluation of advanced structural composite materials and basic material processing techniques, and is to include activities related to construction and testing of standard specimens and representative structural geometries using advanced composite materials. The capability to explore technology under parallel investigation by civilian industry, on a much reduced scale, leads to a more thorough understanding and to some degree allows anticipation of problems related to technology development for Air Force aircraft structures application. The objectives of this effort are to perform in-house fabrication and assessment of payoff potential, through inspection and test, of composite structural concepts, arrangements, and geometries including bonded assemblies and hybrid assemblies where applicable. The in-house approach allows for direct dollar savings as well as indirect savings associated with more timely responses to current problems. Timely responses based on thorough understanding permits a more time- and cost-effective approach to the solution of problems inherent in advanced structural design and development.

Efforts within this work unit will include, but not be limited to, the following: fabrication of unique test specimens, analysis and test of composites in various simulated environments, fabrication of fracture mechanics coupons, development, fabrication and test of elastomeric tooling concepts, support of composite investigations by other laboratory agencies as requested, investigation of an automatic scanning dielectric spectrometer, for monitoring and improving composite cure cycle efficiency, creation and maintenance of displays illustrative of composite applications in airframes, and conducting of tours and presentations explanatory thereof as required.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

3.0010, MATERIALS SUPPORT TECHNOLOGY - ADVANCED OPTICAL CERAMICS

S. Musikant, General Electric Co., Reentry & Environmental Systems Division, *3198 Chestnut St., Philadelphia, Pennsylvania* 19101 (DN875696; N00014-78-C-0466)

There is a need for advanced guided missile sensor enclosures for higher Mach number operations which can operate at specific electromagnetic wavelengths and which have increased resistance to thermal shock and rain and dust erosion. The objective of this program is to investigate and characterize a family of advanced sensor window materials candidates that could decisively exceed performance capabilities of existing materials.

Candidate materials identified in the phase 'O' study will be procured or synthesized. Selected physical properties including transmission, dielectric constant and loss, thermal expansion coefficient, strength etc., will be measured and the materials ranked according to thermal shock resistance. Various fracture toughness enhancement techniques will be investigated. Analytical assessments of performance in specific missions will be performed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0011, IMPROVE TURBINE ENGINE LUBRICANT

B.B. Baber, Southwest Research Inst., *8500 Culebra Rd., San Antonio, Texas* 78228 (DA0P3629; DAAK70 78 C 0001)

Develop improved turbine engine lubricant having increased load-carrying capacity and capable of operating at higher temperatures without sacrificing other performance characteristics.

A coordinated Army, Navy, Air Force effort is being made to determine the degree of lubricant improvement needed considering both Army helicopter turbine engines and the new AGT 1500 tank engine. High-temperature gear/lubricant tests will be conducted as new high-hot-hardness gear materials become available.

SUPPORTED BY U.S. Dept. of Defense, Army, Mobility Equipment Research & Development Command

3.0012, VIBRATIONAL-ROTATIONAL RELAXATION IN CHEMICAL LASERS

F.F. Crim, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Chemistry, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DN975429; N00014-76-C-0341)

Vibrational-rotational relaxation rates in molecular collisions are being determined directly. These are important in the naval areas of lasers and surveillance since they determine, for example, the state population distribution in a molecular laser and how nonequilibrium state distributions relax.

In the initial experiments, a relatively long pulse (microseconds) is used to produce a given excited vibrational-rotational state and a probe laser will measure the population growth in nearby vibrational levels. During this time a short pulse (nanoseconds) laser system will be set up so that rotational relaxation rates can be measured.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, ADAPTABLE WALL WIND TUNNELS FOR V/STOL RESEARCH

W.R. Sears, University of Arizona, School of Engineering, Dept. of Aerospace & Mechanical Engineering, *Tucson, Arizona* 85721 (DN975112; N00014-79-C-0010)

The ability to predict the performance of V/STOL aircraft in the vicinity of the ground and in transitional flight depends critically upon the accuracy of experimental data obtained in wind tunnels. Such data are plagued by uncertain corrections because of the presence of the tunnel constraining walls which interact with the highly deflected, vortical flows. The proposed research will examine the feasibility of the adaptable wall concept--a concept in which measurements made in the flow field far from the model are used in an active loop to control the flow through the walls--to minimize the wall interference effects for V/STOL flight.

To assess the value of the adaptable-wall concept in the V/STOL regime, a study will be undertaken of three-dimensional flows characterized by large lift coefficients (large deflections) and significant wake effect, to determine what the requirments of an adaptable wall tunnel are. Mathematically, the problem is to determine what boundary conditions, enforced in the mid-field of the flow about a real V/STOL configuration, uniquely determine the inner field and assure that it is part of the desired overall flow field. From a practical viewpoint, there are additional questions which must be addressed: what flow variables should be measured and where; what flow variables must be controlled and where to establish the proper boundary conditions accurately and rapidly.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0002, MATERIAL SUPPORT TECHNOLOGY - SOLID PHASE EPITAXIAL GROWTH

M.A. Nicolet, California Inst. of Technology, School of Engineering, Dept. of Electrical Engineering, *1201 E. California Blvd., Pasadena, California* 91109 (DN675034; N00014-75-C-0912)

With the increasing complexity of naval electronic systems, there exists a need to develop new fabrication techniques that will be suitable for precise processing for increased packing density of devices in large scale integrated systems. Solid-solid phase reactions and solid phase epitaxy coupled with ion implantation offer important new methods for realizing reasonably complex layered device structures with a minimum of processing complexity.

The investigator will investigate limits of concentrations of implanted ions in various semiconductor materials, both elemental and compound. Effects of sputtering under high dose rate conditions will be studied as a function of implanted ion mass. Annealing experiments to ascertain the degree of incorporation of impurities into the lattice will be investigated by electrical measurements along with ion beam analysis techniques, i.e., backscattering and channeling.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0003, DEVELOPMENT OF PERFORMANCE CRITERIA FOR LANDING SIGNAL OFFICERS (LSOS)

C.A. Brictson, Dunlap & Associates Inc., Wester Division, *La Jolla, California* 92037 (DN894024; N61339-78-C-0123)

LSO job performance and training standards, and measures of LSO performance variability will be developed.

A systematic, analytic approach will derive measurable LSO performance criteria describing in quantitative terms the relative effectiveness of the LSO. By relating criterion measures to LSO aircraft recovery functions, job relevant measures with inherent face validity will be provided.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Human Factors Lab.

4.0004, SPECTRUM FATIGUE TESTING OF GRAPHITE/EPOXY BOLTED JOINTS

J.F. Haskins, General Dynamics Corp., Convair Division, *P.O. Box 1950, San Diego, California* 92112 (DN881109; N62269-77-C-0340)

To determine the sensitivity of a graphite/epoxy bolted step joint to environmental exposure when subjected to accelerated flight-by flight spectrum fatigue loading typical of naval aircraft. This work is in support of work unit ZA601, Aircraft Technology, Agency Accession No. DN 681080.

A four-step bolted joint between a graphite/epoxy laminate and a 7000 series aluminum alloy. Three series of tests will be performed to determine the statistical distributions of ultimate compression strength; constant amplitude fatigue life in compression; and the compression spectrum fatigue characteristics. Tests will be performed for two environmental conditions; viz. laboratory environment (75 degrees F and approximately 50 percent relative humidity) and after preconditioning for 120 days at 200 degrees F and 95 percent relative humidity.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0005, NAVY VEHICLE DESIGN AND CONSTRUCTION - AIRFOIL OPTIMIZATION BY ADAPTIVE CONTROL OF CAMBER AND THICKNESS

E. Levinsky, General Dynamics Corp., Convair Aerospace Div, *P.O. Box 1950, San Diego, California* 92112 (DN475202; N00014-76-C-0742)

The objective of this investigation is to demonstrate the feasibility of a self-optimizing flexible technology (SOFT) wing which changes its shape (span-wise and chord-wise distribution of camber and thickness) in such a manner as to optimize a given merit function. Such a wing will be able to automatically adapt itself to provide optimal performance throughout the whole flight envelope. This technique will also overcome existing deficiencies in both analytic and wind tunnel methods for truly optimizing airfoil and wing geometries at high subsonic and transonic flight conditions.

The current phase of the research is being directed towards modification and refurbishment of the 1/6 scale semi-span SOFT wing wind tunnel model to correct deficiencies that were identified during the first wind tunnel test and to improve model reliability. When this redesign is completed, a second tunnel entry and test will be conducted with Air Force support at Arnold Engineering Development Center in Tunnel 16T at transonic flight conditions.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0006, FINITE RATE CHEMICAL REACTIONS IN TURBULENT FLOW

M. Gerstein, University of Southern California, School of Engineering, Dept. of Mechanical Engineering, *3551 University Ave., Los Angeles, California* 90007 (DN975395; N00014-79-C-0352)

The objective of this study is to develop a better understanding of turbulent reacting flows for finite rate chemistry. This information is needed both for improved prediction of the complex mixing and combustion processes within the combustors of aircraft turbojet engines, and to provide a basis for advanced combustor design. Ultimately it should lead to improved propulsion systems for naval weaponry applications.

A mixing region will be formed between two uniform liquid streams of different velocity, separated initially by a splitter plate, and mean velocity profiles will be determined with hot film probes. The extent of large-scale mixing will be established by studying non-reactive streams with dye tracers and, by adding salt to one of the streams, with conductivity probes. Molecular mixing will be studied by considering infinitely fast reactions between appropriate acid-base solutions, with one reactant in each stream. Acid-base indicators and ionization probes will be used to locate regions of varying degrees of mixedness and to determine composition profiles. Ultimately, finite rate isothermal chemistry will be studied by using appropriate hydrolysis reactions to produce acid solutions, again monitoring the flow with

indicators and ionization probes. Experimental results will be compared with available theoretical models.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0007, HIGH REYNOLDS NUMBER VISCOUS CASCADE ANALYSIS

M.J. Werle, United Technologies Corp., Research Center, *400 Main St., East Hartford, Connecticut* 06108 (DN890145; N00019-78-C-0604)

Development of viscous/inviscid interaction models for high Reynolds number laminar and turbulent base flow, based on the asymptotic triple deck and interacting boundary layer concept.

Analytical study.

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0008, AUTONOMOUS SATELLITE SENSOR PROGRAM

F.L. Markley, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980065)

The purpose of this effort is to study the accuracy of determination of a spacecraft's attitude and ephemeris by autonomous navigation methods utilizing combinations of star sensors, landmark recognition systems, and inertial reference units and to study the influence of spacecraft nonrigidity on the accuracy attainable.

The study will utilize an error covariance analysis based on optimal estimation techniques and containing models of the spacecraft dynamics (linearized), various sensor configurations, and expected distributions of stars and landmarks. The study will analyze both the absolute accuracy of the spacecraft attitude and ephemeris determination as well as the accuracy with which the location of objects on the earth's surface relative to the landmarks can be established.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0009, THERMOPHOTOVOLTAIC SPACE POWER SUPPLY

J. Severns, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980130)

To gain sufficient understanding of the basic principles involved to permit confident design of a hardened, non-nuclear satellite power supply. Obtaining spacecraft insensitivity to the space radiation environments (both natural and man-made) has required use of a radio isotope heat source in the past. The design complexity involved in overcoming potential problems upon re-entry to our atmosphere makes radioactive materials difficult to use on satellites.

A solar fired, thermophotovoltaic system has been chosen for study. Two components essential to this system are not well understood - the thermophotovoltaic cell itself, and the high temperature thermal storage. Work on the cell will fall into two areas, isolating and eliminating the factors limiting performance in an existing P-I-N/ germanium cell, and consideration of new cells using different geometries, and different materials. The thermal storage component requires reliable containment of a storage material, over several years, at temperatures exceeding 1200 degrees C.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0010, VIRTUAL IMAGE DISPLAY SYSTEM

G. Derderian, U.S. Dept. of Defense, Navy, Naval Training Equipment Center, Advanced Simulations Concepts Lab., *Orlando, Florida* 32813 (DN794008)

This virtual image display system will be an efficient, lightweight, compact, low-cost virtual image device which is needed for synthetic flight trainers and tank drive simulators.

The virtual image display system will contain a combination of optical elements that convert a real image, such as a television tube, into a virtual image such that the scenery appears to be at the real world distances.

SUPPORTED BY U.S. Dept. of Defense, Naval Training Equipment Center, Advanced Simulation Concepts Lab.

4.0011, SUPERCRITICAL AIRFOIL PERFORMANCE

D.E. Hobbs, United Technologies Corp., Pratt & Whitney Aircraft Group, *P.O. Box 2691, West Palm Beach, Florida* 33402 (DN890164; N00019-79-C-0229)

To provide experimental trailing edge aerodynamic information required for developing and verifying an analytical system for predicting exit air angle and total pressure loss for a supercritical airfoil.

Experimental/analytical study.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0012, DESIGN OF DATA BASES FOR PROCESS PLANNING OF MACHINING OPERATIONS WITH APPLICATION TO END MILLING PROCESSES

R.E. DeVor, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Mechanical & Industrial Engineering, *207 Engineering Hall, Urbana, Illinois* 61801

Machining processes such as end milling of aircraft structures possess two characteristics which inhibit process planning; these are (1) part geometries which produce tool paths with continually varying cut geometries, (2) engineering design specifications which do not allow for rework of parts scrapped by tool failure, poor surface finish or out of tolerance dimensions unless at high rework costs. As a result part programmers tend to program for 'worst case' conditions with resulting low efficiency and high machining costs. This research is developing a computer-based information system for the end milling process. Geometric models will relate part geometry to cut geometry. Force models based on cut geometry will help to predict cutter deflection and cutter breakage. Process performance characteristics derived from production floor/DNC feedback as well as machinability test will be modeled and stored for use in predicting process performance as a function of cut geometry and machining conditions.

SUPPORTED BY University of Illinois

4.0013, STUDIES OF EQUATORIAL GHZ SCINTILLATION PROBLEMS 14260-ELX

K.C. Yeh, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (DA0E9192; DAAG29-78-G-0101)

To study experimentally and theoretically equatorial scintillation of transionospheric radio signals. Relevance - this study will address the problem of signal fading in the DOD-wide navigation (global positioning system) and communication systems. For optimum signal design and failure analysis, signal fadings have to be known at location of maximum occurrence (equator).

Emphasis will be placed on GHz scintillations and their relations to scintillations at lower frequencies. Experiments with ATS-O6 and other geostationary satellites are proposed to study multifrequency dependence, multiple scattering effects and climatology of scintillations. Experimental data will be compared with model computations.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0014, DEVELOP RAY TRACE TECHNIQUES

K.C. Yeh, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (DF243000; F19628-75-C-0088)

AF function - ionospheric ray tracing. Deficiency - need to deduce ionospheric structure from limited radio propagation measurements. Research - develop techniques for inversion of

oblique and backscatter ionogram data and for homing in 3-D ray tracing. How research contributes - this research will provide the basis for techniques of frequency management in OTH radars and other real-time applications which use ionospheric observations to optimize system parameters. It will also greatly improve existing techniques for system simulation and diagnosis in the presence of ionospheric irregularities.

Mathematical techniques will be developed, and implemented in the form of computer programs, to convert from measured ionogram data to inferred ionospheric profiles.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Cambridge Research Labs.

4.0015, WEAPONRY - RESEARCH SUPPORTING JET PROPULSION TECHNOLOGY (PROJECT SQUID)
S.N. Murthy, Purdue University, School of Engineering, Dept. of Mechanical Engineering, *Executive Bldg., West Lafayette, Indiana* 47907 (DN524574; N00014-75-C-1143)

In the project 'Principles of Chemical Propulsion and Armaments', this task is a major effort in support of jet propulsion technology; it generates understanding and expansion of knowledge required for the development of jet devices used in naval aircraft, missiles and space vehicles. The objectives of SQUID are: (1) stimulate interests of scientists and engineers in solving Navy-related problems, (2) plan and support basic and applied research relating to jet propulsion, and (3) provide capability for conducting special studies, consulting and probing new avenues of relevant research.

Project SQUID headquarters office, upon approval of the power program, conducts a subcontracting program on physical and chemical processes of energy transformation in relevant scientific areas pertinent to jet propulsion.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0016, AERODYNAMICS RESEARCH
T. Tai, U.S. Dept. of Defense, Navy, Naval Ship Research & Development Center, Aviation & Surface Effects Dept., *Bethesda, Maryland* 20084 (DN678328)

Conduct an analytical and experimental research program to identify attractive aerodynamic techniques for improving the performance of advanced Navy aircraft. Studies will include the development of theoretical methods to determine the viscous drag of three-dimensional bodies, with particular emphasis on interference drag.

A. 3-D drag - in subsonic case, the skin friction over a 3-D body will be determined by applying proper axisymmetric boundary layer solution along a streamline and summing up over the whole body surface. Equations for determining streamline pattern over 3-D general bodies will be formulated and coded in Fortran program. The required inviscid pressure distribution will be obtained either by using 3-D potential flow program or directly by experimental data. Interference drag will be evaluated by considering the effects of cross flow and flow separation. In supersonic case, existing 3-D techniques will be identified. Adaption and necessary modification of the technique will be pursued for applicability to advanced Navy aircraft. B. Airfoil research -experimental verification of an advanced airfoil previously theoretically derived under the present work unit for transonic buffet control will be carried out by testing a representative model. For economic reasons, the experimental program will be conducted in cooperation with NASA Ames.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0017, DIAMOND MACHINED LENS
R. Mergerian, Westinghouse Electric Corp., Defense & Electronic Systems Center, *P.O. Box 746, Balt-Wash Internat. Airport, Baltimore, Maryland* 21203 (DN980055)

To demonstrate the fabrication of corrected geodesic lens in Ti-In diffused waveguides using numericaly controlled diamond machining techniques. Accurate control of the focal point, profile and position of these lenses will be demonstrated. These lenses will be corrected for spherical aberrations using a suitable lens profile. Single and double lens combinations will be fabricated and evaluated. Characterization will include throughput loss, scatter, focal length, diffraction limited performance and acceptance angle. The lenses will be designed for incorporation into microoptical microwave spectrum analyzers jointly under Navy and Air Force development.

Using computer, numerical controlled diamond machining techniques, several microoptical lens will be fabricated. The profile of the lens has been theoretically determined and it allows for corrections for spherical aberrations. Edge rounding is accounted for in the program. Depth control of plus/minus 1 micron and placement of the focal point to better than 10 microns will be demonstrated. Using end-fire coupling techniques, the quality of lens will be examined through far field measurements. Finally, a two lens optical system will be fabricated on a substrate whose edges were precisely polished. Final characterization of the lens will be performed using the Westinghouse photodiode array butt-coupled to the waveguide/lens system.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0018, NAVY VEHICLE DESIGN AND CONSTRUCTION - A MULTIPLE SCALES APPROACH TO THE ANALYSIS & SYNTHESIS OF CONTROL SYSTEMS WITH FAST & SLOW DYNAMICS
R. Ramnath, Charles Stark Draper Lab. Inc., *68 Albany St., Cambridge, Massachusetts* 02139 (DN975512; N00014-79-C-0462)

When high performance vehicles are operated at the extremes of their performance capabilities (i.e., V/STOL transition, aircraft maneuvering to high angle of attack, attack class submarine making rapid depth change or high speed turn, etc.), dynamic instabilities and loss of control may occur. Under these conditions, the equations of motion which describe the vehicle dynamics become time-varying (i.e., equation coefficients vary with time). Current analysis and design techniques are based on the simpler time-invariant systems (equation coefficients are constant) and can lead to erroneous predictions of stability for time-varying systems. The objective of this research is to develop analysis and synthesis methods for control of time-varying systems.

The method of approach will consist of the asymptotic theory of generalized multiple scales in conjunction with extended multi-dimensional Laplace transforms. The temporal behavior of the system response will be extended, by the general multiple scales theory, into multiple time dimensions after a suitable reparameterization based on the ratio of the time constants of the modes of the system response. Multiple Laplace transforms will be used. Each with respect to the respective time scale. The true Laplace transform of the system response will be represented asymptotically as a combination of the individual Laplace transforms, leading to an ordered hierarcy of transfer functions for time varying systems.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0019, MODEL REFERENCE ADAPTIVE SYSTEMS
R.V. Monopoli, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Electrical Engineering, *Amherst, Massachusetts* 01002 (ENG79-06641)

Adaptive control theory deals with control problems in the face of uncertainty. Uncertainty about or ignorance of the external environment or the internal system details often preclude the successful use of nonadaptive control theory. This research is directed toward one class of adaptive systems, the model reference adaptive systems. This class of systems encompasses parameter identifiers and adaptive observers as well as adaptive controllers. Emphasis in this work is on the adaptive controller, and there is both a theoretical and an experimental component. The theoretical part deals with the development of algorithms with improved stability and convergence properties. The experimental part deals with implementing a model reference adaptive control system on the University of Massachussetts Radio Astronomy Telescope.

The previous award number is NSF grant ENG-7616817.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0020, REACTIVE DOWNCONVERTERS FOR RADIO ASTRONOMY AT 75-140 GHZ

P.T. Parrish, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Amherst, Massachusetts* 01002 (ENG7813930)

A thorough theoretical and experimental investigation of millimeter reactive downconverters is being undertaken. A specific reactive downconverter of substantially new design is examined. This instrument converts 115 GHz electromagnetic energy to 20 or 40 GHz, with high conversion efficiency and low noise. This design incorporates three new, important features. First, the downconverter employs newly-developed, gallium arsenide Schottky barrier diodes with planar geometry and beam leads; as contrasted with conventional, whisker-contacted diodes. The use of this diode results in an electrically and mechanically superior downconverter compared to presently available units. Second, superconducting metallization and cryogenic operation of the downconverter reduces losses and thermal noise. Third, extremely low-noise, intermediate frequency MASER amplifiers are used, affording the lowest possible system noise temperature. Comparison of the reactive downconverter with the best resistive downconverters is made. This downconverter has immediate application wherever a low-noise millimeter receiver is needed. Potential applications are (1) radio astronomy and (2) ground-based millimeter communications and radar systems.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0021, NAVY ENVIRONMENT - 24 CHANNEL AMPLIFIER SYSTEM

K.E. Prada, Woods Hole Oceanographic Institution, *Main St., Woods Hole, Massachusetts* 02543 (DN975456; N00014-79-C-0071)

In the spring of 1980, an ice floe station, FRAM II, will be established. FRAM II will be an acoustic receiving station for acoustic energy generated by explosive sources and continuous sources from satellite camps.

The 24 channel system will allow a 3 degree azimuthal accuracy for recording of signal energy, as well as flexibility, in that a combination of geophones and hydrophones may be used on FRAM II. The system will be constructed at Woods Hole Oceanographic Institution.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0022, CORPS OF ENGINEERS REMOTE SENSING USER MANUAL

L.E. Link, U.S. Dept. of Defense, Army, Corps of Engineers, Waterways Experiment Station, *P.O. Box 631, Vicksburg, Mississippi* 39180 (31661)

OBJECTIVE: The objective of this work is to complete a camera-ready draft of a Corps of Engineers Remote Sensing User Manual.

APPROACH: Work accomplished by the WES under Work Unit 003, Remote Sensing of Environment, Task 01, Environmental Quality Management for Military Facilities, Project 4A162121A896, Environmental Quality for Construction and Operation of Military Facilities; work accomplished by the Battelle Corporation on contract through NASA (using Civil Works revolving funds); and ongoing work at the WES under the Earth Resources Satellite R&D program will be combined and molded into a final camera-ready draft user manual. The manual will have three major parts covering remote sensing in the Corps of Engineers, guidance for planning and management of remote sensing applications, and technical guidance. The main parts will be supplemented by appropriate appendices that provide detailed information on sources of available imagery, sources of new imagery missions, remote sensors and their general characteristics, and a user directory for the Corps of Engineers.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Waterways Experiment Station

4.0023, PREVENTION OF ICE FORMATION ON HELICOPTERS

Unknown, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0C8149)

Improve methods of control, prevention, and alleviation of accretion and adhesion of ice on current and future Army helicopters to contribute to all weather operational capability.

Test rotor wing sections in icing conditions using anti-icing methods developed by CRREL and other agencies for helicopter and other applicators.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

4.0024, SYSTEM CONCEPTS

T. Hutchings, U.S. Dept. of Defense, Army, Armament Research & Development Command, Fire Control & Small Caliber Weapon Systems Lab., *Picatinny Arsenal, Dover, New Jersey* 07801 (DA0B0713)

Evaluate new concept options in armament system technology for use on future helicopters, including AH, UH and OH types.

Three seed-type initial efforts will be considered for new armament system technology. One approach is the use of improved high performance heliborne, lightweight, compact armament systems in utility transports to improve operational effectiveness. Various lightweight armament system options will be evaluated to establish a set of options for future armament. Other concept options to be evaluated include a target sensing armament system, incorporating a target sensing projectile and remote piloted vehicle (RPV) armament for helicopter application.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Fire Control & Small Caliber Weapon Systems Lab.

4.0025, AIRBORNE LASER PROPAGATION

B. Contreras, U.S. Dept. of Defense, Air Force, Weapons Lab., *Kirtland Air Force Base, Albuquerque, New Mexico* 87117 (DF169570)

To evaluate the effects of the aerodynamic environment on laser beam propagation. These effects include absorption and scattering by aerosols, boundary layer and atmospheric turbulence, flow field perturbations and shockwave interactions.

Wind tunnel model testing will be compared with flight test and theoretical predictions of optical degradations due to boundary layer turbulence, flow field and shock effects. Optical measurements will also be made on free air atmospheric turbulence in conjunction with balloon-borne and aircraft-mounted micro-termal probes, and compared with meteorological data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

4.0026, INTERFACE HARDWARE, DESIGN, CONSTRUCTION AND MAINTENANCE

R. Trapani, Trapani Engineering Inc., *Berwyn, Pennsylvania* 19312 (DN981028; N62269-78-C-0189)

To design and construct various items of interface hardware for the Basic Configuration No. 1 laboratory effort. To provide maintenance support for various items of interface hardware. This will support work unit ZC910, Agency Accession No. DN 681082.

To procure from the original manufacturer of several of GFE interface hardware the services and material necessary to perform above objective.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Communication Navigation Tech Directorate

4.0027, MECHANISM OF INSERTION IN HIGH CONDUCTIVITY GRAPHITE INTERCALATION COMPOUNDS 15804-MS

F.L. Vogel, University of Pennsylvania, School of Engineering & Applied Sciences, Dept. of Electrical Engineering & Science, *4001 Spruce, Philadelphia, Pennsylvania* 19104 (DA0F9288; DAAG29-78-C-0037)

To understand and control the chemical processes of intercalation and de-intercalation, and to relate these processes to the electrical properties of the resulting materials. Relevance - the research is relevant to generation and transmission of electrical power, electronic warfare, composites for aircraft, mobility, etc. Electrical conductors which have conductivity/weight ratios greater than copper can have a great impact on the design of mobile power plants.

Preparation of materials from highly oriented pyrolytic graphite and intercalants such as iron halides and iron fluorides. Characterization of the materials using combustion analysis, electron beam microprobe, x-ray fluorescence, gas phase ESCA and electrical resistivity. Determination of the degree of charge transfer during intercalation.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0028, INVESTIGATION OF MICROSTRIP AND MICROPATCH ANTENNA

E.S. Harris, U.S. Dept. of Defense, Navy, Naval Underwater Systems Center, *Newport, Rhode Island* 02840 (DN989107)

Investigate and develop the microstrip and micropatch antennas for submarine-satellite communications such as global positioning satellite. Particular emphasis will be in the frequency range above 1 GHz.

Investigation of previous work and applications of the microstrip and micropatch antennas. Design and development of antennas which could be mounted around the masts of a submarine. This would include development of a phasing network for an array of antennas and/or passive arrays to achieve an overhead pattern for satellite use.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

4.0029, GENERAL METHODS TO ENABLE ROBOTS WITH 'VISION' TO ACQUIRE, ORIENT AND TRANSPORT WORKPIECES

J.R. Birk, University of Rhode Island, School of Engineering, Dept. of Electrical Engineering, *Administration Bldg., Kingston, Rhode Island* 02881 (APR74-13935 A02)

This award continues NSF Grant APR74-13935.

This research effort seeks to develop general methods by which computer-controlled robots using visual sensors can: (1) acquire a workpiece (part) so that it may be brought to a fixture without a collision; (2) compute the orientation of a workpiece held in the robot hand; and (3) transport the workpiece to the fixture without collisions. The research is expected to result in new image processing techniques as well as kinematic equations for manipulators and a robot system architecture which will enable a class of presently unsolvable industrial problems to be attacked.

Planned activities include the following: Methods to acquire and orient workpieces with arbitrary resting states will be developed. Features which describe workpiece orientation will be investigated. Some of these features will be based on a partial image of the workpiece and others on the complete image. Features based on gray-scale pictures will be used when features based on binary pictures perform unsatisfactorily. Alternative methods to sample image data from different orientations during instruction will be examined. Graphs of image features versus orientation will be made. Procedures to make a decision about workpiece orientation will be developed which use multiple views of the workpiece. Obstacle avoidance techniques which employ a programmer's ability to specify a normal workpiece trajectory using a switchbox will be tested. Experiments will be performed employing an accurate six-degree-of-freedom robot and a special fixture which houses dial gauges to measure orientation and position. A probabilistic model of the overall process will be formulated in an effort to decrease the average cycle time.

SUPPORTED BY U.S. National Science Foundation, Div. of Advanced Productivity Research & Technology

4.0030, THERMODYNAMICS AND KINETICS OF INTERSTITIAL SOLID SOLUTIONS 16089-MS

R.B. McLellan, Rice University, Graduate School, Dept. of Mechanical & Aerospace Engineering, *6100 Main St., Houston, Texas* 77001 (DA0G9084; DAAG29-79-C-0108)

To study the thermodynamics and kinetics of hydrogen dissolved interstitially in metal solid solutions, in order to obtain realistic thermodynamic models of such alloys. Relevance - the research is relevant to the synthesis and processing and subsequent properties of many metal alloys in current use in weapon components, ammunition, mobility and construction applications, and in the degradation of high strength steel and aluminum alloys used in aircraft and tank structures by hydrogen embrittlement.

Thermodynamic and kinetic measurements on a series of binary and ternary solid solutions containing dissolved hydrogen as a function of temperature and pressure to determine the nature of atomic interactions responsible for the quantities measured. Thermodynamic and kinetic measurements to determine deviations from ideality of the solubility of interstitials due to trapping sites and impurity atoms. Modelling of lattice occupancy sites by interstitials as a function of basic thermodynamic and kinetic parameters ranging from metallic solid solutions having low solubility (alloys of iron, aluminum, nickel) to those for which solubility is very high (body-centered cubic modifications of Nb, V, and Ta).

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

4.0031, ANALYSIS OF ATMOSPHERIC OZONE MEASUREMENT FROM SATELLITES USING MILLIMETER RADIOWAVES

A.W. Straiton, University of Texas, Austin Campus, School of Engineering, Dept. of Electrical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: The molecular resonance radiation lines of ozone at 102.7 and 110.8 GHz provide a means by which the amount and distribution of this gas in the atmosphere might be measured from a satellite such as the space shuttle.

Observations from an orbiting satellite might provide global coverage in a short time span. This research investigated how such soundings might effectively be made.

A parametric model for vertical ozone distribution was chosen. The antenna temperature as measured at a satellite near the two frequencies under consideration was calculated in terms of the model parameters. The radiation from a particular elevation and the absorption before reaching the satellite were calculated. The integral effects of the background noise and the atmospheric radiation was used to determine the antenna temperature in the vicinity of the absorption lines.

Calculations suggested that a nadir angle of 80.5 degrees would be optimum for a satellite elevation of 275 km. This provides a path whose nearest approach is 11 km above the earth. The percent change in emission temperature between the resonant frequency of 101.7 GHz and a frequency shifted by 100 MHz is 91% which should provide for accurate measurements.

A computer routine was developed for determining the parameters in the ozone model chosen from experimental data.

SUPPORTED BY University of Texas

4.0032, IMPROVED STREAM MEASURING CAPABILITIES

W.R. Cook, U.S. Dept. of Defense, Army, Corps of Engineers, MGI Systems Div., *Fort Belvoir, Virginia* 22060 (DA0M8111)

To determine feasibility of developing optical sensors that will provide specific stream measurements such as water velocity, and stream width from remote positions such as in aircraft, armored or other vehicles and forward observation sites.

Utilizing reports and specifications resulting from previous USGS work in this area, conduct a design study for a state-of-the-art model. Based on results of study, build a brassboard model for use in conducting experiments to determine feasibility of technical objectives. Related ongoing efforts by other DOD agencies, industry, civil government agencies and allied nations will also be investigated to determine potential application to this effort. This will be a joint USAETL-USGS project. For those technical objectives that appear feasible, based on the results of these investigations, work will continue under project 4A763712D862 (ARTINS) commencing in FY 78.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Engineer Topographic Lab.

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, DEVELOPMENT OF ALABAMA RESOURCES INFORMATION MANAGEMENT SYSTEM

R.I. Vachon, Auburn University, School of Engineering, Dept. of Mechanical Engineering, *Auburn, Alabama* 36830 (NAS 8-32215)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0002, HIGH RESOLUTION TRANSMISSION ELECTRON MICROSCOPY OF LUNAR AND METEORITIC MINERALS

P.R. Buseck, Arizona State University, School of Liberal Arts, Dept. of Geology, *Tempe, Arizona* 85281 (EAR79-08507)

This work is a continuation of studies previously funded by NASA but which have been transferred to NSF. The project will obtain fundamental information regarding the histories of lunar and meteoritic minerals. The fine-scale structural details that can now be made visible by high resolution transmission electron microscopy will be studied. An attempt is then made to correlate these structural perturbations with associated geological events and processes. Specific tasks to be studied include the following: (1) exsolution textures and anti-phase domains in lunar and meteoritic pyroxenes, and their interpretation for determining cooling histories; (2) the possibility of trace amounts of water residing in normally anhydrous lunar and meteoritic minerals; (3) the nature of the sheet silicates in selected carbonaceous chondrite matrices; (4) possible structural distiactions between minerals in isotopically anomalous and 'normal' coarse-grained inclusions in the Allende meteorite; (5) the use of pyroxene fine-structures to resolve certain problems of the achondrites and chondrites, such as the shallow or deepseated origin of the Shaw meteorite.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0003, PLANETARY CARTOGRAPHY

R.M. Batson, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-01453)

The objective of this project is to prepare shaded relief, albedo, and/or contour maps of the planets and natural satellites with various kinds of remote sensing data (mostly digital television pictures from planetary spacecraft). Compilation of a series of controlled photomosaics of Mars at 1:2,000,000 will continue, along with revision of existing 1:5,000,000 shaded relief maps where appropriate. Compilation of special purpose maps of all planets for topical studies will continue. Compilation of maps of the Galilean satellites of Jupiter with Voyager data will begin.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, GLOBAL INVENTORY OF GLACIAL AND PERIGLACIAL FEATURES ON MARS

B.K. Lucchitta, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02377)

Preliminary survey of Viking images for ice-related features. Study of analogs in literature and on terrestrial satellite images and areal photographs. Classification of glacial and periglacial features identified. Selection of symbols and suitable criteria for portrayal of ice-related features on map. Systematic survey of all photomosaic subquadrangles of Mars at 1:1,250,000 and 1:2,000,000 scales as they become available, and plotting of location and extent of features on these maps.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0005, RADII AND MASSES OF PLUTO AND COMPANION

R.L. Wildey, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02352)

A refinement of the masses and radii of Pluto and its new satellite will be sought. The actual image elements of 42 images of the solar system pair will be treated as observations predicted by a mathematical model incorporating the 2 radii, 6 orbital elements, at least 2 atmospheric/astronomical 'seeing' parameters, and rotational parameters.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0006, ECOHYDROLOGY OF ARID REGION VEGETATION

R.M. Turner, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Federal Bldg. Room 4J, Tucson, Arizona* 85701 (WR 76-145)

Water is becoming increasingly scarce in the arid region of the United States. In his attempt to manage or control this essential resource, man is constantly modifying the regional hydrology by changing water-table elevations, altering surface drainage patterns, controlling streamflow, and altering erosion. These and other modifications may result in altered water quality and often result indirectly in vegetation changes that reflect the changed regional hydrology. Man also changes the vegetation directly through agricultural practices, urbanization, vegetation management activities, all of which have an impact on the region's hydrology.

To define the interrelationship between the region's hydrology and its vegetation. To measure the effect that the changing patterns of vegetation have on the regional water supply and, conversely, the effect that changes in water quality and quantity have on the vegetation.

Use historical documents and old photographs to determine the scope of vegetation changes. Use remote sensing products such as aerial photographs and satellite images to locate, map, and measure existing vegetation. Riparian and phreatic vegetation will be emphasized because, compared to the area they occupy, their hydrologic and ecological significance is disproportionately great. The communities are valuable wildlife habitats and recreation sites; at the same time they consume and transpire large amounts of water. Studies of desert plant populations will be made because vegetation changes at dry sites may be sensitive indicators of large-scale climatic change.

Work was begun on a compilation for Arizona of natural or man-made areas from which grazing has been excluded. Such range-reference areas provide base-line data for judging erosion rates and vegetation change. The report on evapotranspiration (ET) in saltcedar stands at Buckeye, Arizona was completed. The best method for estimating ET combines terms from energy-budget, mass-transfer, and stomatal-resistance methods.

Completion is planned of the following studies: Range-Reference Areas, Revegetation of Abandoned Lands, Estimating Moisture in Desert Soils. Work to begin on review of literature on unsaturated flow.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0007, REMOTE SENSED DATA BASE FOR HSPF

R. Johanson, Hydrocomp Inc., *201 San Antonio Cir., Suite 280, Mountain View, California* 94040 (79-R-X0563; K609A-464)

OBJECTIVE: This agreement between NASA and EPA provides for the testing of HSPF (Hydrologic Simulation Program Fortran) using a remote sensed data base as opposed to a normal one.

APPROACH: NASA is transferring funds to EPA to accomplish the task. The required test and output report will be accomplished via a specific task of the comprehensive contract outlined in Task 474.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Research Lab.

5.0008, REPLACEMENT OF XDS-930 COMPUTER AT THE CHATANIKA RADAR FACILITY

C.H. Dawson, S R I International, Radio Physics Laboratory, *300 Ravenswood Ave., Menlo Park, California* 94025 (ATM7823802)

The Chatanika Incoherent-Scatter Radar Facility is a ground-based diagnostic tool which, by remotely sensing a large number of atmospheric parameters, guides progress in understanding of high latitude phenomena and atmospheric dynamics. The facility has a strong history of service to a large segment of the atmospheric science community.

Usage of the Chatanika Incoherent-Scatter Radar Facility by visiting scientists still continues to increase, and more complex experiments are being proposed. The XDS-930 computer at Chatanika requires replacement to allow these scientists and their experiments to continue to be properly supported. This grant provides for: 1. Replacement of the XDS-930 with a Harris 123 virtual-memory computer. 2. Design, fabrication, and installation of digital hardware to mate the existing computer interface, integrator, and Versatec printer/plotter to the new computer. 3. The reprogramming of the on-line data acquisition program and associated revision of the users operating handbook.

These changes will make possible the continued leadership of the Chatanika facility in significantly advancing our understanding of the physics of the auroral and high latitude upper atmosphere, a region of pivotal importance to future development of the field.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0009, SEASAT PROGRAM - 'GROUND TRUTH VERIFICATION OF SEASAT-A DATA'

J.D. Jarrell, Science Applications Inc., Research Meteorology, *1200 Prospect St., La Jolla, California* 92037 (K7-932; MO-A01-78-00-4328)

OBJECTIVE: The following objectives are proposed: 1) Compare surface stress and wind estimates obtained from Seasat-A data to surface stress and wind values obtained from multi-level profile and fluctuation measurements made from a ship; 2) relate discrepancies between Seasat derived estimates and measured values to hydrostatic stability and wave age conditions; and 3) evaluate satellite derived sea surface temperatures on the basis of measured sea surface temperatures.

APPROACH: Measurements inferred from Seasat-A will be compared with available unique ground truth data collected in the satellite footprint by a cooperating agency's research vessel.

The approach anticipated is as follows: Design and coordinate analysis procedure to make results from both sets of sensors as compatible as possible for intercomparisons. Averaging periods for shipboard results will be established. Statistics which delineate temporal and spatial intermittence will be specified.

Specify and coordinate procedures which will provide optimal spatial and temporal coverage from shipboard measurements. This task will require comparisons of satellite and shipboard system.

Design and develop procedures to incorporate ship data not coincident with footprint and other synoptic data.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0010, SUMMARY OF GEOLOGIC HISTORY OF THE MOON

D.E. Wilhelms, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02364)

STATES TO WHICH PROJECT PERTAINS: California.

Prepare a summary of the geologic history of the surface of the Moon mostly as worked out by photogeologic investigations. Include a description of methods and a history of the investigations.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0011, MODELING CLIMATIC EFFECTS OF CARBON DIOXIDE INCREASES

J.B. Knox, University of California, Central Office, Lawrence Livermore Lab., *P.O. Box 808, Livermore, California* 94550 (3028; W-7405-ENG-48)

This project will use several models including the Livermore 2-dimensional Zonal Atmospheric Model (ZAM-2) and a simplified 1-dimensional climate/carbon reservoir model, to study the response of the global climate to increased atmospheric CO2 concentrations. An objective of this work is to narrow the range of uncertainty in assessing temperature changes by considering the effects of hydrologic balance, the vertical thermodynamic, kinetic and chemical structure of the atmosphere, and meridional transport. Other Livermore models, particularly the Stratospheric Chemistry/CO2 model will be used in conjunction with the ZAM-2 and simplified 1-D model to study the effect of changes in long and short wave radiation on atmospheric composition and the thermal effects due to increased CO2 on stratospheric ozone.

SUPPORTED BY U.S. Dept. of Energy, Office of Carbon Dioxide Research & Assessment

5.0012, THE SCRIPPS SATELLITE REMOTE SENSING FACILITY

R.L. Bernstein, University of California, San Diego Campus, Scripps Institution of Oceanography, Ocean Research Division, *P.O. Box 1529, La Jolla, California* 92038 (OCE78-19888)

This project supports the initial operation of a research oriented, satellite data receiving and processing facility. The facility, which is located at the Scripps Institution of Oceanography, is designed to serve a wide range of oceanographic investigators, including faculty and students from Scripps and other institutions. The facility will receive data both directly, from a local antenna, and indirectly by special telephone line and magnetic tape exchange, from the NIMBUS-G and TIROS-N satellites. A computer processing and display system will allow investigators to handle these data sets in near real-time, so that the data can help direct field investigations. The facility is designed to be operated by investigators themselves, with a minimum level of training. Emphasis of initial research efforts will be on the multi-spectral analysis of ocean emissions and reflectances covering the visible, infrared, and microwave portions of the spectrum, in order to provide information on a wide range of oceanographic phenomena. These include weather and climate related studies of oceanic rainfall and sea surface temperature variability; temperature and chlorophyll variability and their ecological significance; studies of optical properties of the sea surface; and studies of internal waves.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0013, THERMAL HISTORY OF ENSTATITE CHONDRITE METEORITES

J.M. Herndon, University of California, San Diego Campus, Scripps Institution of Oceanography, *P.O. Box 1529, La Jolla, California* 92038 (EAR-00932)

This work is a continuation of studies previously funded by NASA but which have been transferred to NSF. The project will obtain information about the thermal history of the enstatite chondrite meteorites. The micro-structure of the metal phases in the enstatite chondrites will be examined and the presence and morphology of the iron carbide phases will be used to determine the nature of thermal history which the meteorite has undergone. The study will attempt to determine the cooling rate of the metal within the meteorite as a function of sample location and construct thermal models in order to obtain the boundary conditions on the circumstances relating to the cooling of the meteorite.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0014, COHERENT LIDAR STUDIES

F.F. Hall, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (BAC44691)

PROJECT OBJECTIVE: Develop pulsed coherent CO2 lidars to measure atmospheric winds and concentration of gaseous species. Demonstrate wind and species concentration measurement capability, collect aerosol data, and verify system performance. Initiate development of airborne and satellite-based lidar systems.

CURRENT YEAR PLAN: Complete and test the laboratory pulsed coherent CO2 lidar system. Start integrating system into van. Perform system testing of EPA CW CO2 lidar at IR test range.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0015, GEOPHYSICAL INSTRUMENTATION DESIGN

C.J. Roubique, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9780-01757)

Design and engineering assistance will be provided for the development or modification of geophysical instrumentation used in minerals related studies including an airborne VLF EM system, a data acquisition system for aircraft use, a computer controlled IP receiver, and a system for EM scale model measurements.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0016, REMOTE SENSING GEOTHERMAL

K. Watson, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (9790-00922)

To extend the use of a theoretical thermal model to more complex geological situations including topographic and surface-roughness effects, to develop computer methodology for registration of aircraft images acquired at different times in the diurnal cycle and apply these techniques to the analysis of multispectral data acquired for the island of Hawaii. Also to digitally enhance LANDSAT images of part of the Cascade Range, interpret these scenes for geologic linear features, and statistically analyze significant trend directions and spatial distribution patterns. Results of these analyses will be applied to delineating major geologic structures in the Cascade Range and evaluating their possible control on geothermal reservoirs.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0017, AIRBORNE OPERATIONS

R.A. Mills, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046 MS939, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9790-00917)

Major emphasis will be placed on the flying of our scheduled survey programs and the further refinement of systems and techniques. Planned programs include surveys in these categories and locations: Radiation and magnetics, Washington; Spectral reflectance, thermal infrared, Powder River, Wyoming; Radiation and magnetics, southwest states; Radiation and magnetics, Papago, Arizona; Spectral reflectance, thermal infrared, Nevada test site.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0018, TESTING OF SATELLITE UPLINKED REMOTE SURFACE WEATHER STATIONS IN THE SIERRA NEVADA

D. Rottner, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, *Federal Ctr., Mail Stop 913, Denver, Colorado* 80225 (0035)

STATES TO WHICH PROJECT PERTAINS: California and Nevada.

The Automatic Environmental Surface Observation Platform (AESOP) has been developed to provide near real-time hydrometeorological data from remote sites to support weather modification research decisions. Cloud seeding opportunities are in part determined through an analysis of data received from the AESOP's.

During the 1977-1978 winter season tests were performed at manned sites in the Sierra Nevada. The following seasons will be a period of observing reliability in isolated settings with the information obtained being used as part of the project data base. With a successful comparison to other methods of data collection the use of the AESOP's will be expanded.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0019, HYDROLOGY OF ARKANSAS RIVER BASIN

J.L. Hughes, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Pueblo, Colorado* (CO 62-016)

The Arkansas River Valley in Colorado is an area of intensive water use and has a variety of water problems. Snowmelt from the mountains provides most of the streamflow but is supplemented by water from summer thundershowers and from transmountain diversions. Most of the yield is from the basin above Canon City, but most of the use is downstream from Pueblo and is for irrigation supplies between Pueblo and the Kansas state line. The stream is overappropriated and distribution of water in time and space needs improving to benefit the water users and the economy of the state. To effect better water management practices, models of the valley are needed so that predictions can be made of alternate water-management plans involving conjunctive use of ground water and surface water.

To improve our knowledge of the various facets of the hydrologic system. To collect, compile, and analyze hydrologic data needed for planning and administering water use in the Arkansas River Valley.

Provide a continuing inventory of both ground and surface water use, collect data on the natural variations of water availability, relate geologic and hydrologic phenomena, and develop digital computer models that will simulate the hydrologic system.

Continued to make seepage loss evaluations to assist in refinement of transit losses in Arkansas River Valley to Kansas state line, updated water-management model with new data collected, developed model to predict peak-discharge data at points in river system had Pueblo Reservoir not been constructed, made 1,095 water-level measurements in 693 wells, continued evaluation of water quality and hydrologic effect of irrigation return flow in river system, installed and made operational satellite equipment at surface-water site (Avondale) and collected and published surface-water records.

Evaluate results of 600 c.f. release from Pueblo Reservoir for transit losses in Arkansas River, calibrate and complete

report on effects of Pueblo Reservoir on flooding in river system, continue to collect and evaluate ground water, surface water, and water quality data to develop optimum hydrologic understanding of river system, and evaluate results of continued data collection on effects of irrigation return on quality of water in river system and publish results, publish results of reconnaissance of hydrologic setting in Crowley and Kiowa counties.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0020, LIDAR MEASUREMENTS OF AEROSOLS
K.M. Haught, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980205)

To measure the optical properties of atmospheric aerosols using laser radar (lidar) techniques. Lidar systems are being considered for a variety of remote sensing applications, and this effort potentially offers a methodology for extending lidar techniques to include aerosol monitoring.

A prototype lidar will be assembld by combining existing NRL components with a ND-YAG laser operating at 1.06 micrometers. The prototype will be constructed to be compatible with NRL's double-ended aerosol particle-size-distribution spectrometers. Additionally, a Biomation Model 8100 waveform analyzer will be integrated with a Nova 1210 mini-computer.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Ocean Systems Center

5.0021, ADVANCED TEST ASSESSMENT - WIDEBAND DATA
S.L. Ossakow, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN780162)

To describe the equatorial scintillating environment that the DNA Wideband Satellite will propagate through. The program will provide a predictive capability regarding the irregular structures and involve the interpretation of data collected with the satellite and associated equatorial in situ and ground-based measurement field programs. The ionospheric phenomena and their relation to the nuclear disturbed ionosphere will be addressed.

Use will be made of electrostatic plasma fluid type codes originally developed for nuclear cloud striation research and adapted for equatorial F region phenomena. Results will be obtained for different parameterizations of the environment. Information obtained will be made available to SRI International and other associated wideband research programs, and aid in interpretation of experimental results and suggesting new experiments.

SUPPORTED BY U.S. Dept. of Defense, Defense Nuclear Agency

5.0022, BASE-LINE STUDIES FOR ENVIRONMENTALLY MONITORING FOR EFFECTS OF SPACE TRANSPORTATION SYSTEMS
D.H. Vickers, State University System of Florida, University of Central Florida, School of Natural Sciences, Dept. of Biological Science, *P.O. Box 25000, Orlando, Florida* 32816 (NAS10-8986)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Kennedy Space Center

5.0023, AIRCRAFT MEASUREMENTS OF AEROSOL OPTICAL PROPERTIES DURING THE MONEX PROGRAM
E.M. Patterson, Georgia Inst. of Technology, School of Geophysical Sciences, *Atlanta, Georgia* 30332 (ATM7820149)

The objective of this research is to obtain airborne measurements of the radiative properties of aerosol particles on aircraft operated as part of the Monsoon Experiment (MONEX), a regional subprogram of the Global Atmospheric Research Program (GARP), to be carried out during the First GARP Global Experiment (FGGE). Observations will be taken of aerosol size-number distributions, the spectral variation of the particle complex refractive index for visible radiation, and particle composition and shape using instrumentation mounted on NASA's Convair 990 aircraft during the Summer MONEX, May - June 1979. Similar observations from aboard the National Center for Atmospheric Research's (NCAR) Electra aircraft will be made during Winter MONEX, December 1978. These data will also be available for analyses under this program. Observations of the radiative characteristics of aerosol particles along the aircraft flight paths will be coordinated with those of other MONEX scientists who will be obtaining aircraft radiation data and ship-based aerosol and atmospheric turbidity measurements. These results will be used to determine the contribution of the aerosol particles to the rates of atmospheric heating measured by the radiation instrumentation installed on each aircraft for studies of the effects of heat sources on the monsoon circulation. MONEX is a major study to increase our knowledge and understanding of the dynamics and thermodynamics of the atmosphere and ocean in monsoon regions. Three research areas have been identified for this experiment. They are the Arabian Sea, the Bay of Bengal and Indonesia-Malaysia. MONEX is important scientifically and also has significance for global agriculture, economics and politics. The initiative for MONEX is from the Government of India with the USSR and USA playing major roles. In addition to the benefits mentioned above, MONEX offers an excellent opportunity for scientific and technical cooperation between, and of mutual benefit to, the U.S., India and the USSR.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0024, NORTH PACIFIC EXPERIMENT (NORPAX) - CURRENT PROFILE SECTIONS ACROSS THE EQUATOR DURING THE NORPAX FGGE SHUTTLE
R.R. Harvey, University of Hawaii System, Manoa Campus, School of Arts & Sciences, Dept. of Oceanography, *2444 Dole St., Honolulu, Hawaii* 96822 (OCE7821320)

This project is part of the North Pacific Experiment (NORPAX). The long-range goal of NORPAX is to understand fluctuations in the upper layers of the Pacific Ocean with time scales of months to years and space scales in excess of 1,000 kilometers, and the relationship of these oceanographic fluctuations to the overlying and adjoining atmosphere. Achievement of this goal should eventually lead to improved weather/climate prediction for both the Pacific Ocean and North America.

One major component of NORPAX is a coordinated field experiment to monitor the space and time variability of the density and velocity fields of the upper layers of the equatorial Pacific current system. This field program will occur between January 1979 and June 1980 and will involve a number of scientists. Measurements will be made from ships, airplanes and moored instruments. This grant will provide Dr. Harvey with the funds to organize and direct the vertical profile current measurements that will be made from the monthly equatorial shuttle ship cruises. Dr. Harvey will ensure the quality of the data and make the initial examination of the data. In addition, he will make the data available to the other equatorial shuttle experimenters and assist in their utilization of these important measurements.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Ocean Sciences

5.0025, DECATUR COUNTY LINEAMENT AND FRACTURE TRACE MAPPING
T.K. Greeman, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *1819 N. Meridian St., Indianapolis, Indiana* 46202 (IN 78-055)

Greensburg, Indiana, the primary supplier of water for Decatur County, has suffered near complete loss of their ground water supply wells during recent months. The county is underlain with limestone, dolostone and shales. Overlying these units are two unconsolidated units of till. Till thickness ranges from 0-100 feet within the county. Bedrock wells have the highest yield, but bedrock well yields are highly variable. Examination of aerial photographs indicated mappable lineations in the bed-

rock and wells with higher yields are probably situated in or near these lineations.

To study the relationship of permeability in the limestone and dolostone aquifer underlying much of Decatur County to the distribution and density of fracture traces and lineations mappable from aerial photos.

Drillers' logs have been examined to determine availability of lithologic, specific capacity and other data. Several hundred wells tapping the limestone-dolostone are distributed throughout the county. Specific capacity can be related to thickness of bedrock in each well. The examination indicated a wide range of specific capacity and permeability. The information from this and other logs will be related to the distribution and density of fracture traces and lineations at the land surface. Stereo aerial photography of the county will be obtained to determine the density of the fracture traces and lineations and a map showing their occurrence will be constructed.

Fracture traces have been marked on stereo aerial photographs and transferred to topographic maps. Field checking of existing domestic wells for location and verification of information on drillers' logs is complete. Determination of the distribution and density of fracture traces has been accomplished, but the application of the relationship of permeability to those fracture traces will be left to another study in FY 79 that will incorporate more data from other studies.

Publish topographic map with fracture traces, accompanied by a short, descriptive text.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0026, CONDUCT SHORT COURSES IN REMOTE SENSING

W.A. Franklin, Murray State University, School of Environmental Sciences, Dept. of Geography, *Murray, Kentucky* 42071 (NAS13-11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0027, PROGRAM ADMINISTRATION

J.R. VanLopik, Louisiana State University, Agricultural & Mechanical College, Center for Wetlands Resources, *University Station, Baton Rouge, Louisiana* 70803 (M/A-1)

OBJECTIVES: Objectives are (a) to identify needs and opportunities that fit within the Sea Grant mission,; (b) to marshall intellectual talent and infrastructure of LSU and participating institutions for appropriate mission-oriented response to perceived needs and opportunities; (c) to maintain administrative functions of the Office of Sea Grant Development required for effective program operations, planning and fiscal accountability; (d) to scope Sea Grant efforts in terms of state priorities; and (e) to contribute Louisiana expertise and experience to national and international goals.

ANTICIPATED BENEFITS: (a) Efficient use of available resources in coherent thrust problem-solving will strengthen the University, advance the state, and increase national visibility for the Sea Grant federal-academic partnership and (b) advancement of a broad spectrum of economic, social, educational and governmental institutions in Louisiana's marine sector.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0028, AUTOMATIC DATA ACQUISITION

R.R. Reynolds, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Equipment Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8AA860)

OBJECTIVE: Develop two classes of automatic weather stations: 1. Sensor Processor And Display (SPAD) - a low-cost station for WSO, WSMO, etc. using NWS inventory of sensors. 2. Shipboard Environmental Data Acquisiton System (SEAS) - a shipboard system with forecast playback on CRT. SEAS I has manual entry of data only; SEAS II has complete sensor preprocessing of basic parameters.

APPROACH: 1. SPAD - New equipment will be interfaced to SPAD as it becomes available by designing interface cards for each. The SPADs delivered for evaluation must be maintained and upgraded as new interfaces become available. Problems found in software and hardware must also be corrected. A hobby computer system will be used to develop a SPAD. 2. SEAS - Award contract for prototype SEAS I and II without forecast input software.

PROGRESS: 1. SPAD - Development of the first phase demonstration units is completed. We will soon install one at Dulles International Airport. 2. SEAS - Development model installed on commercial container ship for further evaluation. Work has begun on specifications for prototype units.

SUPPORTED BY U.S. Dept. of Commerce, National Weather Service, Systems Development Office

5.0029, REQUIREMENTS AND SYSTEMS EVALUATION

M.T. Sikorski, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Integrated Systems Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8C27BB2)

OBJECTIVES: To serve as the NWS focal point for advanced ADP planning. Also, to serve as the NWS focal point for evaluation of new operational requirements as to their potential impact on the overall NWS system. Perform systems engineering studies to determine cost-effective alternatives for accomplishing NWS objectives so that NWS management has a solid basis from which to make decisions.

APPROACH: Through systems engineering analysis and design, take new stated functional requirements (from O/H, OM&O, OTS) and translate these requirements into alternative designs involving hardware, software, and procedural changes, if needed. Evaluate these alternatives in terms of effectiveness in meeting the requirement, cost, impact on the present system, etc. Make appropriate evaluations and present recommendations to NWS management. Also, inventory NWS ADP capability in order to evaluate future ADP needs. Evaluate proposed enhancements (to AFOS, data acquisition/dissemination, etc.), as if they are new requirements.

PROGRESS: 1. Serving as NWS ADP focal point. 2. Procurement package for Satellite Image Display System (SIDS) is complete.

SUPPORTED BY U.S. Dept. of Commerce, National Weather Service, Systems Development Office

5.0030, NATURALLY AND ARTIFICIALLY STIMULATED ELECTRON PRECIPITATION NEAR THE PLASMAPAUSE

T.J. Rosenberg, University of Maryland, College Park Campus, Inst. for Physical Science & Technology, *College Park, Maryland* 20742 (DPP76-82041 A01)

This is a supplement to NSF grant number DPP76-82041.

In this research project, naturally- and artificially-stimulated electron precipitation near the plasmapause will be investigated. The principal measurements will be of bremsstrahlung x-rays using balloon-borne scintillation counters. Complementary measurements of VLF emissions and possible DC electric field measurements will also be included on a number of flights.

The balloon-borne measurements will be carried out at Siple Station, Antarctica, in the austral summer of 1979-80. These measurements will be part of a combined rocket-balloon-satellite and ground-based study of Very-Low-Frequency wave interactions with energetic electrons in the earth's magnetosphere which is jointly sponsored by NSF and NASA.

Logistics support is required for four persons plus associated scientific equipment at Siple Station, Antarctica, during the austral summer of 1979-80.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0031, NAVY ENVIRONMENT - COOPERATIVE SUN EARTH DATA

R. Markson, Airborne Research Associates, *46 Kendal Common Rd., Weston, Massachusetts* 02193 (DN875511; N00014-78-C-0500)

As part of an international effort the objective of this research is to measure the mapping down of electric fields from the ionosphere into the troposphere. The information is necessary to an understanding of the mechanisms of solar terrestrial weather relationships for application to the naval weather forecast.

The principle investigator will measure the electric field and conductivity between 5 and 10 km altitude simultaneously with the balloon flights of Holzworth and Mozer of UCLA to be conducted at 24, 32, and 38 km at Thompson, Canada. The observations will be made during July or August 78 depending upon the GOES satellite schedule and will also be coordinated with the European 1978 SBARMO campaign (Scientific Balloon and Radiation Monitoring Organization).

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0032, TIME VARIATIONS IN THE GLOBAL CONCENTRATION OF OZONE AND IN THE SOLAR CONSTANT

P.V. Foukal, Atmospheric & Environmental Research Inc., *872 Massachusetts Ave., Cambridge, Massachusetts* 02138 (ATM77-26521 A01)

Study of solar flux ('constant') variations and global ozone statistics has yielded interesting new evidence for solar influences on ozone concentration at both high and low latitudes. This grant will continue an investigation of the effect of UV variations due to solar faculae on the ozone production rate. The program will include a test of specific destruction mechanisms of ozone at high latitudes, by the charged particles associated with solar coronal holes, which have recently been shown to account for a large fraction of auroral events. The statistical analysis of solar constant measurements from the NIMBUS-6 data for 1977-1978, the NIMBUS-G, and also the ACRIM on the Solar Maximum Mission (1979) will be initiated. The continued analysis will permit a decision as to whether the increase of solar constant seen in the ground-based measurement is present above the atmosphere, or whether uv faculae modulate atmospheric transmission through their influence on the concentration of ozone and NOx. The same statistical study of power spectra of the new solar constant data, and their cross-correlations and linear regressions with the projected areas of faculae and sunspots, will also permit significant constraints to be put on the effect of strong magnetic fields on energy transport near the photosphere.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0033, MILLIMETER WAVE MEASUREMENTS OF ATMOSPHERIC MOLECULES

A.E. Lilley, Harvard University, Cambridge Campus, Harvard College Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (ATM79-05585)

A portable, ground-based millimeter wave spectrometer has been successfully developed under a previous National Science Foundation grant (ATM 75-15890) and used to obtain high-quality ozone emission profiles. Ozone observations are made on a regular basis at all times of the day and night with a 6% uncertainty in the millimeter wave profile strength that affects the derived ozone distribution.

A comprehensive evaluation of the millimeter wave spectrometer by simultaneous operation with a series of balloon and rocket flights and overpasses of the NIMBUS-G satellite is the basis of this grant. The spectrometer will be located at Wallops Flight Center site U-80. Operation of the millimeter wave spectrometer simultaneously with these other devices will provide a unique opportunity for direct comparison of the ozone distribution derived from the millimeter wave measurements with the results obtained by other ozone measuring techniques.

In addition to the major effort on ozone, the millimeter wave spectrometer will be used to continue the search for other molecular trace constituents.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0034, MELTING BEHAVIOR AND PHASE RELATIONS OF LUNAR SAMPLES

J.F. Hays, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Geological Sciences, *Cambridge Station, Cambridge, Massachusetts* 02138 (EAR79-06321)

This work is a continuation of previous studies funded by NASA but which have now been transferred to NSF. Experimental petrology will be applied toward the understanding of: 1) origin and crystallization history of lunar igneous rocks, and 2) planetary differentiation processes on Moon, Earth, and the parent bodies of achondritic meteorites. Mineral chemistry will be employed as a guide to source lithology or parent magma for lunar samples and meteorites.

Specific tasks will involve: 1) Controlled cooling-rate studies used to develop understanding of igneous rock textures and to establish criteria for estimating cooling-rates of natural rocks, 2) Petrographic and experimental studies of achondritic meteorites used to develop petrological and chemical models for interiors of planets and meteorite parent bodies, and 3) Models of crystal accumulation and melt segregation to be developed and applied to problems of planetary sizes and differentiation histories.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0035, SUPPORT OF THE MILLSTONE HILL INCOHERENT SCATTER RADAR DURING SOLAR MAXIMUM CONDITIONS

J.V. Evans, Massachusetts Inst. of Technology, Lincoln Lab., *244 Wood St., Lexington, Massachusetts* 02173 (ATM79-09189)

The Millstone Hill Incoherent Scatter radar has recently been considerably upgraded for studies of the ionosphere and upper atmosphere at auroral and subauroral latitudes through the addition of a full-steerable 150' antenna moved to the site (with support from the National Science Foundation). The new antenna permits almost the entire auroral convection pattern (60 degrees is less than A which is less than 75 degrees) to be observed in one day, and efforts to exploit these results in studies of the relationship of the convection pattern to the interplanetary solar magnetic field, the field-aligned current into the polar cap, the formation of the nighttime trough, and the variation of the electron densities, electron and ion temperatures at auroral and subauroral latitudes. These measurements form part of the U.S. program for the International Magnetosphere Study. They are being coordinated with observations at the other incoherent scatter radars, with balloon, whistler and aircraft observations over Canada and/or satellite observations. Other uses for the new antenna include studies of the electrodynamic coupling between the E- and F-regions through tidal generated polarization electric fields, the latitudinal variation (Hough functions) of tides propagating into the lower thermosphere, and for special events - such as the recent eclipse over Canada, or rocket launches from Wallops Island. The period funded under this grant includes the end of the observing phase of the International Magnetosphere Study and the commencement of a follow-on phase of data reduction and continuing observations during the maximum of the current solar cycle (expected to peak in 1981). This grant provides funds for operation of this facility.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0036, GLOBAL TRANSPORT PROCESSES AND INTERACTIONS WITH TRACE CONSTITUENTS
R.E. Newell, Massachusetts Inst. of Technology, School of Science, Dept. of Meteorology, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (6443; EY-76-S-02-2195)

We are trying to understand the large-scale energy budget of the atmosphere-ocean-cryosphere system with the hope that we may then arrive at rational explanations for the observed changes in the energy budget. There has been much speculation that anthropogenic carbon dioxide, or tropospheric aerosol may, or will soon, influence climate. There has also been much consideration of possible changes of ozone to anthropogenic effects and the resulting possible changes on ultraviolet radiation received at the ground and on climate. It is desirable to understand in detail the operation of the system as it is presently constituted before one attempts to gauge the influence of potential changes. Our approach has been to study global observations in an effort to gain this understanding. Global data on wind, air, and sea temperature, pressure, moisture, and other trace constituents are studied. Computations of means, variances and covariances, empirical orthogonal representations, and trends are made. Correlation between results and measurements of total ozone, volcanic eruptions, stratospheric and tropospheric aerosol, and food production in several countries is developed. Computation of radiative heating rates by trace substances, such as carbon dioxide, water vapor and ozone is made. The data base for atmosphere and ocean has been developed at MIT. The ozone data was obtained from Atmospheric Environment Service, Canada.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0037, NAVY ENVIRONMENT - EXPLOSIVE OCEANIC CYCLOGENESIS
F. Sanders, Massachusetts Inst. of Technology, School of Science, Dept. of Meteorology, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN975335; N00014-79-C-0384)

The ability of Navy weather forecasters to predict weather conditions to be encountered by Navy vessels and aircraft transitting vast ocean distances or participating in local fleet exercises has a significant impact on the safety and feasibility of such operations. The sudden, unexplained deepening of some oceanic, extratropical lows revealed a weakness of conventional analysis and the impact of this inadequacy on computer models. This research has as its goal the defining of those processes which contribute to explosive deepening of oceanic extratropical low pressure systems.

The contractor is conducting research to determine the effects sensible heat transfer from the sea has upon explosive deepening of oceanic extratropical low pressure systems. He is also investigating the influence of latent heat transfer on this explosive deepening. Satellite information is being utilized to determine the extent and influence of convective action on the process.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0038, INSTRUMENTATION DEVELOPMENT FOR LASII EQUATORIAL MEASUREMENTS
E. Trzinski, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581110)

AF function - maintain communications between Air Force units during periods of small scale ionospheric irregularities. Opportunity -model can be developed to provide inputs to systems designer to mitigate the effects of small scale ionospheric irregularities on VHF/UHF transionospheric radio signals. Objective - develop an instrument capable of making positive ion composition measurements with a very high spatial resolution at satellite velocity. How research contributes -provides measurements essential to an understanding of the physical-chemistry and transport processes involved in the creation of ionospheric irregularities.

A quadrupole mass spectrometer instrument capable of making positive ion composition measurements with a spatial resolution of three meters at satellite velocity shall be developed. Three such instruments shall be fabricated for ensuing flights on STP Program NRL sponsored, LASSII satellites.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0039, NAVY ENVIRONMENT - SYNTHETIC APERTURE RADAR SENSING OF THE OCEAN SURFACE
R.A. Shuchman, Environmental Research Inst. of Michigan, *P.O. Box 8618, Ann Arbor, Michigan* 48107 (DN675694; N00014-76-C-1048)

All-weather remote assessment of coastal wave-spectra is desirable for a variety of naval and Marine Corps operations; it may also provide clues on underwater topography. Only the synthetic aperture radar offers sufficient resolution for this task. Theoretically, it is not known how this will work because the target moves but it has been shown that in many cases useful results can be obtained.

Contractor will use his own SAR data base for testing developed imagery models, develop a technique to accurately measure surface roughness by SAR, further develop direct Fourier derivation techniques for wave spectra and apply enhancement techniques. Application of results so far achieved under this contract to problems of Navy investigators, and participation in upcoming information SAR-using experiments will both be prepared.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0040, NAVY ENVIRONMENT - SIMULATIONS OF OCEANOGRAPHIC FLUCTUATIONS IN THE NORTH PACIFIC OCEAN
S. Jacobs, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Atmospheric & Ocean Science, *Ann Arbor, Michigan* 48104 (DN223750; N00014-76-C-0141)

Large-scale long-term variability in the temperature structure of the upper ocean has a pronounced effect on acoustic propagation conditions and hence on our surveillance systems. The objective of this project is to develop a dynamic ocean model using numerical techniques which will simulate and forecast the temperature, transport, and surface heat balance in the north Pacific Ocean. This project is an integral part of the North Pacific Experiment (NORPAX).

Because observed atmospheric data are used to 'drive' the ocean forecasting model, it is necessary to compile, analyze, and condense appropriate information such as solar radiation, humidity, air-sea temperature differences, surface winds, etc. The ocean forecasting model itself utilizes fundamental hydrodynamic principles and is programmed for a computer. Because observed oceanic data is used to test the model, it is necessary to compile appropriate information.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0041, DEFORMATION, TEMPERATURE, AND FABRIC STUDIES ALONG A FLOW LINE, BARNES ICE CAP, BAFFIN ISLAND, CANADA
R.L. Hooke, University of Minnesota, Minneapolis Campus, School of Earth Sciences, Dept. of Geology & Geophysics, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (EAR77-21098 A01)

This project involves a continuation of studies on the flow mechanisms and temperature distribution along a vertical section extending from the divide to the margin of the Barnes Ice Cap, Baffin Island, Canada. Temperatures, horizontal velocities, and vertical strain rates will be measured in six holes, and cores taken for ice fabric studies. Four of the holes have been completed in the past three years and another started. The two remaining holes will be completed during the next year, and all holes resurveyed the following year. Data collected will be used to study anisotropy in the ice and its effect on the flow law and to study the feedback between the increase in flow rate caused by increase in temperature and the increase in temperature caused by increase in flow rate. The ultimate objective is to de-

velop and test a computer model of the flow field and temperature distribution in the ice cap.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0042, STATIC ENERGY ANALYSIS OF PROJECT SESAME DATA

G.L. Darkow, University of Missouri, Columbia Campus, Graduate School, Dept. of Atmospheric Sciences, *205 Jesse Hall, Columbia, Missouri* 65201 (ATM79-09988)

This research contributes two important elements to the SESAME (Severe Environmental Storms and Mesoscale Experiment) Regional Subprogram. An enhanced surface data set is being developed for experimental lays during April and May of 1979 by combining non-archived surface meteorological data in the SESAME region with data routinely archived at the National Climatic Center. Sources of supplemental surface meteorological data include power plants, agricultural experiment station experimental farms, forest fire observational networks, small airports, cooperative climatological observers, and air pollution monitoring stations. Data are carefully screened to insure high quality. This surface data set will be combined with the SESAME upper air data to perform a three-dimensional static energy analysis of the antecedent severe storm environment. There is particular interest in: (1) what influence the additional surface data along with the more frequent upper air and satellite information may have, using static energy as the analysis parameter, in pinpointing the time and location of subsequent severe storm development; (2) what influence the additional surface data may have on the ability to infer subsynoptic spatial variations in the mean heat and moisture content of the boundary layer by means of hourly analysis of the surface static energy fields.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0043, DEVELOP AIRBORNE NADIR LASER FOR MONITORING MOLECULAR POLLUTANTS IN THE TROPOSPHERE

R.T. Thompson, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J883A-039)

OBJECTIVE: Design, construct and interpret data from airborne nadir-viewing laser differential absorption systems. A CO2 laser system will be developed to measure ozone. A frequency-doubled dye laser system (approx. 300mm) will be developed to monitor sulfur dioxide. The use of differential absorption systems to monitor selected tracer gases will be investigated.

APPROACH: The systems each consist of two lasers, the wavelengths of which have been selected to optimize the difference in reflected signal due to the wavelength dependence of the pollutant or tracer gas. A computer code has been developed to simulate data tapes using a model atmosphere. Simulations are used to develop interpretive software and analyze system parameters.

PROGRESS: A prototype ozone system was ground tested successfully on a topographic target and a report has been written. A paper has been written evaluating candidate tracer gases which can be monitored using the differential absorption system. An airborne system for monitoring ozone has been constructed.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Support Lab.

5.0044, SNOW COVER ANALYSIS IN NEW ENGLAND USING LANDSAT DIGITAL DATA

C.J. Merry, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (31584)

OBJECTIVE: To synoptically map snow cover and to determine if a relationship exists between the water equivalent of the snowpack and the associated radiance values obtained from LANDSAT computer compatible tapes (CCT's).

APPROACH: Digital processing of selected CCT's will be accomplished to map the areal extent of snow. A relationship between the water equivalent of the snowpack and the associated radiance values on the LANDSAT CCT's. Snow course data in two New England watersheds are providing the ground truth to enable this comparison to be made. In addition, a newly developed microwave sensor to quantitatively assess the water equivalent of the snowpack will be tested. LANDSAT spectral band ratios of the radiance for selected snow course sites that provide the most reliable information for correlation to the water equivalent of snow data will be evaluated. Ground truth information on vegetation, slope, aspect and elevation are being compared to the results of the computer classification maps. The number of ground truth data stations required when using the CCT's for prediction of water runoff associated with the snowpack will also be determined. Significant savings in costs can result if snow surveys can be accomplished using LANDSAT digital data rather than ground survey procedures. The results of this investigation will be presented in ETL's and technical reports for use in flood forecasting in cold regions.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

5.0045, CONDUCT SHORT COURSES IN REMOTE SENSING

S.R. Morain, University of New Mexico, School of Arts & Sciences, Dept. of Geography, *University Hill N.E., Albuquerque, New Mexico* 87106 (NAS13-109)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0046, REMOTE OBSERVATIONS OF SEVERE STORMS

R.E. Orville, State University of New York, Albany Campus, School of Science & Mathematics, Dept. of Atmospheric Science, *1400 Washington Ave., Albany, New York* 12222 (NAS 8-33380)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0047, PUBLIC AWARENESS OF AND MANAGEMENT GUIDELINES FOR COASTAL ZONE VISUAL RESOURCES

D.B. Harper, State University of New York, College of Environmental Science & Forestry, School of Landscape Architecture, *Syracuse, New York* 13210 (R/P-16)

OBJECTIVES: 1. To determine the predictive value of quantitative shorescape descriptors for identifying viewer preferences and attitudes. 2. To increase a statewide public audience's awareness of the visual resources of the state's coastal zone. 3. To provide coastal planners and managers with methodological guidance in incorporating visual quality into the planning process.

ANTICIPATED BENEFITS: 1. Helping widen citizens' perspective on the diverse visual resources of New York's coasts: stimulating positive action by local environmental groups, providing illustrative educational material for coastal zone planners and managers, and providing educational material for high school and college environmental programs. 2. Assisting coastal planners and land-use decision-makers at the state, regional, and local levels in integrating into the comprehensive planning process the essential but often slighted consideration of visual quality.

IDENTIFIED BENEFITS TO DATE: (R/P-13, Visual Quality of New York State's Coastal Zone) Provided a forum in

which researchers, public agents, and coastal residents could hear about and discuss the concept of visual quality as it applies to the planning process and to the many other concerns of the coastal zone.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0048, ANTARCTIC METEORITES - CHEMISTRY, MINERALOGY AND PETROLOGY

J.J. Papike, State University of New York, Stony Brook Campus, Graduate School, Dept. of Geology, *Stony Brook, New York* 11790 (EAR78-21857)

The mineralogical and petrological characterization of selected Antarctic meteorites will be undertaken in this study. A complete model analysis and microprobe analyses of all phases in 10 to 20 meteorites will be carried out to obtain information regarding the types and petrologic grades present within the recently collected specimens. Research on basaltic achondrites will be carried out in order to study the nature of brecciated materials which may represent regolith samples from other planetary or asteroid bodies. The complete modal, petrographic, chemical and chronological study of the lithic fragments within the analyzed howardites will be obtained. This information will provide important insights into the surface geology and geochemical evolution of the basaltic achondrite parent bodies from which some of the Antarctic meteorites were derived.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0049, COASTAL METEOROLOGY

G.S. Raynor, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973 (000547; EY-76-C-02-0016)

This study is designed to obtain an understanding of meteorological processes in the coastal region that affect siting, operation, and safety of power-producing and related facilities located either offshore or near a coastline. The study involves climatological investigations, tracer experiments, wake-effects studies, mesoscale and micrometeorological observations, theoretical studies, and modeling programs. A major goal of the program is to develop a reliable system for describing diffusion conditions affecting releases from coastal or offshore sites and to predict them from measurable meteorological and surface parameters such as general synoptic situation, type of flow (sea-breeze or gradient), wind and temperature structure, sea-surface roughness, and coastal terrain. Meeting this goal involves an understanding of conditions in the transition region where over-ocean flow is modified by passage over land as well as over the water. Results of this program will include techniques for the prediction of over-ocean and coastal wind and temperature fields which not only transport and diffuse pollutants but are involved in air-sea interactions and oceanic processes. They will also include a rating of sites along the U.S. East and Gulf coasts in terms of onshore wind frequency, diffusion capacity, and severe weather prevalence.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0050, ANTARCTIC SEARCH FOR METEORITES

W.A. Cassidy, University of Pittsburgh, School of Arts & Sciences, Dept. of Earth & Planetary Sciences, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DPP78-21104)

The University of Pittsburgh proposes to investigate areas of glacial ablation, moraines and other areas of accumulation on the antarctic ice caps for meteorites. This project is a follow-up of three very successful antarctic meteorite collection expeditions. Of major value are the basically contamination-free specimens, which are highly significant for the study of the chemical and physical evolution processes of the early solar system. The proposal addresses the important question of estimating a true fall flux of meteorites. This includes an attempt to determine the interrelationship of ice dynamics and meteorite accumulation.

During the 1979/80 summer season two scientists will do field work in the area of the Ellsworth Mountains, and four scientists will do field work in the McMurdo area. Using snow mobiles and helicopters for transportation, they will operate from one or two camps, followed by a continuation of the ice dynamics studies near the Allan Hills, which were started during the 1978/79 field season. There will be a total of four University of Pittsburgh scientists in Antarctica on this project during the 1979/80 summer season.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0051, SOLUTION THEORIES OF SILICATE MELTS - AN EXPERIMENTAL AND THEORETICAL STUDY OF LIQUID IMMISCIBILITY

P.C. Hess, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (EAR74-13378 A01)

This project concerns an experimental and theoretical analysis of the phase, structural, and solution characteristics of aluminous silicate melts. The research will include: (1) an experimental determination of liquid immiscibility in the systems CaO-Al2O3-SiO2, NaAlSi3O8-SiO2 and Mg2SiO4-KAlSi2O6-SiO2, (2) a determination of the composition of co-existing liquids in the system CaO-MgO-TiO-SiO2 which have been doped with small amounts of Al2O3 or K2O-Al2O3, (3) experimental determination of trace element fractionation between the two phases in naturally occurring immiscible silicate melts, and (4) a theoretical extension of solution models to include multicomponent melts. The results of these efforts will be applied to a better understanding of magmatic processes and will also be of use to glass technology.

This is a continuation of EAR74-13378.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0052, HISTORY OF BOTTOM CURRENT SCOUR IN THE SOUTHERN OCEAN

T. Huang, University of Rhode Island, Graduate School of Oceanography, *Administration Bldg., Kingston, Rhode Island* 02881 (DPP78-08511 A02)

This is a continuation of DPP78-08511.

The long-term objective of this three-year program is to examine the bottom current paleovelocity problem, and to compare the timing of scour events with climatic parameter to elucidate cause and effect relationships. Progress during the first year was very good, with identification of regional disconformities in the sedimentary record as the major objective. The work during the second year will include completing the determination of paleomagnetic polarities in the Islas Orcadas cores, the identification of hiatuses created during periods of increased bottom water flow originating in the Weddell Sea and in the Indian Ocean, and the preparation for a high southern latitude cruise of R/V Atlantis II in 1979-80.

The committed duration of this continuing grant is three years, 07/01/78 to 06/30/81.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0053, DIRECT OBSERVATIONS OF THE INTERIOR CHARACTERISTICS OF OKLAHOMA THUNDERSTORMS DURING SESAME 79

P.L. Smith, South Dakota School of Mines & Technology, Inst. of Atmospheric Sciences, *Rapid City, South Dakota* 57701 (ATM7827018)

This study involves collection and analysis of direct observations of the interior characteristics of Oklahoma thunderstorms during the Severe Environmental Storms and Mesoscale Experiment (SESAME) 1979 field program. The emphasis of the research is on determining the thermodynamic characteristics and the vertical air motions in the storm interiors, as well as

the hydrometeor (cloud droplets, raindrops, graupel, hail, and other particles) characteristics and growth processes. The analysis of the observations is directed towards improved understanding of the intrastorm processes and the storm-environment interactions, including studies of entrainment processes. The analysis is being carried out in coordination with the analysis of the other aircraft, radar, surface, and satellite meteorological observations to be collected under the SESAME 79 Storm Scale Sub-Program.

The observations are obtained using an armored T-28 aircraft equipped with an elaborate meteorological instrumentation system and digital data recording equipment. The work is being conducted as a cooperative endeavor involving the South Dakota School of Mines and Technology, the National Center for Atmospheric Research, and the National Severe Storms Laboratory.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0054, HIGHER PLANT RESPONSE TO ELEVATED ULTRAVIOLET IRRADIANCE

M.M. Caldwell, Utah Higher Education System, Utah State University, School of Natural Resources, Dept. of Range Science, *Main Bldg., Room 104, Logan, Utah* 84321 (NAS 9-14871)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

5.0055, REMOTE SENSING OF PORPHYRY COPPER ALTERATION ZONES

R.G. Schmidt, U.S. Dept. of the Interior, Geological Survey, Eastern Mineral Resources Branch, *12201 Sunrise Valley Dr., MS 912, Reston, Virginia* 22092 (9360-01942)

STATE TO WHICH PROJECT PERTAINS: Arizona.

The project will develop and test techniques of remote sensing of large sulfide deposits, especially porphyry copper type deposits, by digital processing of LANDSAT data. Attempts will be made to relate rock alteration zones, soil minerals, and reflectance characteristics as measured from near-surface with reflectances obtained by scanners in satellites. Methods devised will be tested by using them as evaluation tools in suitable incompletely explored areas that are regarded as favorable for the occurrence of porphyry copper deposits.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0056, ANTARCTIC MAPPING OPERATIONS

R.B. Southard, U.S. Dept. of the Interior, Geological Survey, *12201 Sunrise Valley Dr., MS 912, Reston, Virginia* 22092 (DPP79-06412)

This interagency agreement continues support of the U.S. mapping operations in Antarctica. The geodetic, cartographic, and support activities of the U.S. Geological Survey include field control for mapping and for science projects, as needed. Support for international responsibilities of the U.S. under the Scientific Committee on Antarctic Research will be provided by exchange of cartographic materials with other countries and the preparation and maintenance of photographic and map files and indexes. The computation and adjustment of previously established control and the printing of aerial photography for mapping and for reference purposes will also be carried out.

Cartographic field work planned for 1979-80 and the winter of 1980 will be carried out by two USGS cartographic engineers on the satellite observations program at South Pole Station, and three USGS cartographic engineers in the Ellsworth Mountains area during the summer field season of 1979-80. Two NOAA engineers will observe weather satellite data at McMurdo during 1979-80.

Previous work on this project has been carried out under Interagency Agreement DPP77-17777.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0057, OCEAN WAVE DATA ACQUISITION & MODELING FOR THE FACILITATION OF COASTAL MANAGEMENT DECISIONS IN ISRAEL & THE U.S. (ABBREV)

V. Goldsmith, Virginia Inst. of Marine Sciences, *Gloucester Point, Virginia* 23062

OBJECTIVES: Strengthen the marine research and development capabilities of Israel and the VIM Sea Grant Program by concentrating effort in the area of wave information, which is to all coastal planning and thereby encouraging sound CZM. Specifically, the tasks will be undertaken by: (a) transferring technology between VIMS and IOLR personnel, while (b) training personnel in use of this technology; (c) mutual development of new techniques and applications; (d) exchanging and comparing similarly obtained data; and (e) mutually developing and improving advisory service and CZM functions. Specific tasks for the first year include: (a) synthesis of existing, but widely varying kinds of wave data; (b) initiation of a strongly needed program in wave measurements; (c) improvement of IOLR's and VIMS' remote sensing abilities by evolving techniques for ocean wave photography; (d) refinement and extension of the Israeli Wave and Longshore Transport Model by application of it to the analysis of a proposed coastal development; (e) initiation of a program of computer modeling of shoreline changes and the effects from coastal structures calibrated with time series data measured by Golik in Israel.

ANTICIPATED BENEFITS: These projects will be initiated jointly at VIMS and completed at IOLR, with salary and other support from IOLR. Thus, specific products will result from the first year's effort which will significantly enhance Israel's capability in this area. Emphasis on advisory services and perhaps other disciplines is expected to evolve later. Additionally, this program is expected to benefit the VIMS Sea Grant Program through the exchange and comparison of similarly obtained data in contrasting shelf areas, by increasing the spectrum of applications, and through the mutual development and application of new projects such as coastal models calibrated with previously obtained Israeli shoreline data. Initial contacts have been made (Goldsmith spent five months in Israel in 1977), and mutual goals clearly identified. Thus, we anticipate an efficient program with concrete results at the end of the first year. This is a clear case where international cooperation will fulfill some very real and specific needs, in a geographic area where the benefits from such a program may well encourage additional cooperation.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0058, RESEARCH STUDY - STRENGTH AND CONSTITUTIVE BEHAVIOR OF SOILS IN A VERY LOW GRAVITATIONAL FIELD

S. Storre, Virginia Polytechnic Inst. & State University, Graduate School, *Blacksburg, Virginia* 24061 (NAS 8-33449)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

5.0059, MOUNTAIN-INFLUENCED AIRFLOW AND TURBULENCE IN THE FIRST KILOMETER ABOVE THE EARTH SURFACE (ABBREV)

J.R. Connell, Battelle Memorial Inst., Pacific Northwest Laboratories, *P.O. Box 999, Richland, Washington* 99352 (ATM79-00983)

The greastest deficiency in the current efforts to understand the influence of mountains on atmospheric flow is the lack of reliable observational data. This project is designed to alleviate this problem by making radiosonde and aircraft observations upwind and downwind respectively of a suitable mountain. Considerable thinking went into the selection of the site since this is most important to obtain comprehensive field observations.

The observational program will use the NCAR Queenair research aircraft for one two-week period in February 1978. Upwind data needed to initialize the model will be obtained

using radiosondes. The data collected will be used to validate the three-dimensional airflow model of Terry Clark at NCAR.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0060, OPTICAL EFFECTS OF ATMOSPHERIC AEROSOL

A.P. Waggoner, University of Washington, School of Engineering, Dept. of Civil Engineering, *206 Guggenheim Hall, Seattle, Washington* 98105 (R800665-13; G832B-EA-014)

OBJECTIVE: To investigate the characteristics, causes, and effects of visibility degradation due to atmospheric aerosols.

APPROACH: Field studies are conducted at selected sites to determine the levels of visibility degradation and the species responsible. Special instrumentation and techniques are developed as needed.

PROGRESS: The light scattering coefficient and fine (less than 2.5 micron diameter) particle mass concentration were measured in urban, rural, and pristine areas. In all cases they were highly correlated (r greater than 0.95) and in the same ratio. The integrating plate method of measuring the light absorption coefficient has been further calibrated. Ambient measurements show that absorption typically accounts for 30-50% of extinction in urban areas and that it is caused by a graphitic material, probably elemental carbon.

SUPPORTED BY U.S. Environmental Protection Agency,
Office of Research & Development,
Environmental Sciences Research Lab.

5.0061, CHANNEL MORPHOLOGY AND SEDIMENTATION IN PHEASANT BRANCH NEAR MIDDLETON

R.S. Grant, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Madison, Wisconsin* (WI 77-084)

Severe channel and bank erosion in Pheasant Branch and accelerated sediment deposition in both Pheasant Branch Marsh and Lake Mendota are occurring within the basin. The problem is not unique to Pheasant Branch but occurs throughout the country. To study any more than a small percentage of these areas, remote sensing techniques need to be employed. On-site measurements of various erosion and water-quality parameters are needed to calibrate the remote-sensing imagery and evaluate the applicability of remote sensing in the detection and monitoring of sedimentation and water quality.

The objective of the project is threefold: (1) to evaluate sedimentation and stream-channel morphology in the Pheasant Branch Basin; (2) to obtain ground measurements of sediment transport, streamflow, and channel properties; and (3) to evaluate remote-sensing techniques with respect to detection and monitoring sediment loadings in small basins.

During the five-year project the following items will be completed for Pheasant Branch Basin: (1) evaluate the headwater erosion and stream-channel morphology; (2) analyze effects of urbanization on stream-channel morphology, sediment transport, and delta formation; (3) project changes in channel geometry, streamflow, and sediment transport; (4) delineate between stream-channel and upland erosion; (5) identify critical areas of erosion and suggest required management practices; (6) supply cooperator with sediment transport, streamflow, sediment-source, and channel-geometry data for remote-sensing imagery calibration.

Compared 1971 and 1977 channel surveys. Surveyed additional cross-sections at sites throughout basin. Installed additional recording grain gage at western edge of basin.

Continue monitoring streamflow and sediment at gaging stations. Resurvey 1977 channel cross-sections. Calibrate Middleton storm-water management model and use for various development conditions. Do bed material survey.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Water Resources Div.

5.0062, PRECIPITATION RATES FROM WAVE AND INFRARED RADIOMETRY AND USE OF SEASAT-A DATA TO DETERMINE HURRICANE PRECIPITATION (ABBREV)

J.A. Weinman, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Meteorology, *500 Lincoln Dr., Madison, Wisconsin* 53706 (7-924; MO-AO1-78-00-4320)

OBJECTIVE: SEASAT-A SMMR data will be used to demonstrate the remote determination of rainfall rates by microwave radiometry. The proposed study will build upon experience gained in the analysis of NIMBUS-5 ESMR data, and an important objectve will be to utilize the SMMR data to monitor rainbands in hurricanes during the course of their evolution.

APPROACH: Develop rainfall analysis procedures taking advantage of SMMR multispectral microwave imagery supplemented mainly by infrared experience. Obtain ground truth from digitized radars, such as in the D-Radex and those in operational NWS networks which provide VIP displays. Raingage network data will be obtained for ground truth to check the rainfal rates inferred from SEASAT-A observations. Rainfall distributions from SEASAT-A will be tracked as hurricanes develop and travel westward across the Atlantic Ocean. The analysis will be extended to include the effects of capillary waves and foam.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic
& Atmospheric Admin., National
Environmental Satellite Service

5.0063, DIAGNOSTICS OF THE HEAT SOURCES AND SINKS OF THE ASIATIC MONSOON AND THE THERMALLY FORCED PLANETARY SCALE RESPONSE

D.R. Johnson, University of Wisconsin, Madison Campus, School of Natural Sciences, Dept. of Meteorology, *Agriculture Hall, Madison, Wisconsin* 53706 (ATM78-22384)

The objective of this research is to study the summer and winter Asiatic monsoonal circulations and their interaction with the planetary scale atmospheric circulations. The distribution of heat sources and sinks within the region of the Asiatic monsoons, as well as within the planetary scale, will be diagnosed by two methods. The first method will be to model the distribution of latent, sensible and radiative heating components in the monsoon region using conventional meterological data, results of other investigators, and satellite data. The second method will be to diagnose heating using a specialized model developed by the PI. The heating distribution from the two methods will be compared and studied. These results, together with conventional data, will be used to isolate the thermally forced mass, energy and angular momentum transport by the Asiatic monsoon and to study its interaction with other planetary circulations.

The data to be used for this study were obtained during the observational phases of the Global Weather Experiment (FGGE) and the Monsoon Experiment (MONEX). Both are subprograms of the Global Atmospheric Research Program (GARP) and took place from late 1978 through 1979.

This project adresses major scientific objectives of MONEX: (1) to obtain a clearer understanding of the interactions between the Asian monsoon and the global circulation, and (2) to obtain quantitative knowledge of heat sources and sinks of the Asian monsoon area.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0064, BALANCE OF THE TROPOSPHERIC OZONE AND ITS RELATION TO STRATOSPHERIC INTRUSIONS INDICATED BY COSMOGENIC RADIONUCLIDES

R. Reiter, Institut fur Atmosphärische Umweltforschung der Fraun. Gesel, *Kreuzeckbahnstrasse 19 Frg, Garmisch Partenkirchen, Federal Republic of Germany* (6450; EY-76-C-02-3425)

The balance of the tropospheric ozone is governed by the distribution of ozone sources and sinks. The influx of the stratospheric ozone into the troposphere as a result of stratospheric intrusions and the portion of the tropospheric ozone due to photochemical production are under study. The influence of trace

gases and aerosols on ozone decay is examined. During interesting intervals of time the diurnal variations of the atmospheric ozone profiles are measured up to 35 km altitude by means of balloon sondes. Causes of the variations are discussed. A filter photospectrometer for the measurement of the total atmospheric ozone is tested as to its suitability by direct intercomparison with a Dobson spectrometer. Ozone concentrations greater than 70 ppB are observed in pure-air regions after stratospheric intrusions as well as due to photochemical production in the boundary layer. An observation series covering a period of 20 months of the stratospheric aerosol is presented.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0065, IONOSPHERIC ELECTRON CONTENT MEASUREMENT
Z. Houminer, Radio Observatory, *Haifa, Israel* (DA0E9305; DAERO 79 G0020)

The objective is the continuous monitoring of the total electron content above Haifa using the 136.14 MHz transmissions of the Sirio Satellite. The diurnal, seasonal and solar activity dependence on TEC will be determined.

The TEC measurements will be carried out at the radio observatory laboratories at Haifa using a plarimeter system received on loan from the US Army Communication Command.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Research & Standardization Group

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, RESEARCH PSYCHOLOGY APPLIED TO MEDICALLY SIGNIFICANT PROBLEMS IN ARMY AVIATION (06)
K.A. Kimball, U.S. Dept. of Defense, Army, Medical Research & Development Command, Aviation Psychology Div., *Fort Rucker, Ozark, Alabama* 36360 (DA0D6738)

To provide US Army aviation information that is medically important about the human factor in the aircraft man-machine system, with special emphasis on the performance of this human factor and the variables that influence it.

The approach will involve the application of current research techniques applicable to the objective as well as developing new techniques as required.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0002, RESEARCH OF VISUAL PROBLEMS MEDICALLY SIGNIFICANT TO ARMY AVIATION
R.W. Wiley, U.S. Dept. of Defense, Army, Medical Research & Development Command, Bio-Optics Div., *Fort Rucker, Ozark, Alabama* 36362 (DA0B6891)

To provide information about the visual sensory modality relating to capability of the human visual system and the impact of military equipment, environmental and operational influences on visual performance and integrity.

The approach will include psychophysical, electrophysiological, and other objective techniques to evaluate human visual performance with quantitative measures.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0003, RESEARCH OF BIOENGINEERING AND VIBRATION PROBLEMS MEDICALLY SIGNIFICANT TO ARMY AVIATION
T.M. Erhardt, U.S. Dept. of Defense, Army, Medical Research & Development Command, Bioengineering & Life Support Equipment Div., *Fort Rucker, Ozark, Alabama* 36362 (DA0E6733)

To determine the short-term clinical effect of helicopter vibration on the musculoskeletal system and to develop an orthopaedically, anthropometrically sound helicopter crew seat to reduce vibration effects.

Prospective clinical and epidemiologic study using physical examination subjective reporting forms, Norland bone mineral analysis, biochemistry, and x-ray techniques. Seat design and validation will be accomplished statically and dynamically on a three-degree-of-freedom, man-rated vibration table using dynamic EMG techniques. Pilot performance and efficiency are studied. Animal models are used and the techniques of tetracycline bone labeling and scanning electron microscopy of the joint surfaces are employed.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0004, EFFECTS OF HEAT ACCLIMATION AND EXERCISE ON ACCELERATION TOLERANCE
C.H. Brown, California State University & Colleges, California State University, Hayward Campus, Graduate School, *25800 Carlos Bee Blvd., Hayward, California* 94542 (NCA 2-290801)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0005, IN-FLIGHT BIO-MEDICAL ASSESSMENT OF NAVAL AIRCREW MEMBERS
D.H. Reid, U.S. Dept. of Defense, Navy, Pacific Missile Test Center, Crew Systems Branch, *Point Mugu, California* 93042 (DN777291)

The objective of this study is to acquire multi-parameter physiological and engineering data from aircrew men continuously throughout flight in order to assess human performance and reliability in wide spectrum of flight environments utilizing increasingly sophisticated and stressful weapons systems and platforms. Acquisition of these data is required in order to evaluate effects of higher sustained g loading and flight performance capability of pilots and naval flight officers in new generation tactical aircraft. A realistic physiological data base acquired during air combat maneuvering and tactical missile engagements and launch is required to objectively develop life support system specifications and for the study of the combined stressors of flight.

A man-borne tape transport instrumentation system is used to acquire and store bio-medical and engineering data in flight. Seven parameters are acquired throughout flight. Close collaboration/liaison with USAF has been maintained.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Medical Research & Development Command

6.0006, PERSONNEL TECHNOLOGY - COMPLEX CONTROL PROCESSES IN SKILLED MOTOR PERFORMANCE
D. Norman, University of California, San Diego Campus, Center for Human Information Processing, *P.O. Box 109, La Jolla, California* 92037 (DN975356; N00014-79-C-0323)

This work will formulate models of the cognitive control processes and knowledge structures responsible for skilled performance in tasks requiring complex psychomotor control. Examples of such tasks are keying in, formation flying, and skilled use of tools. The models devised in this effort will be able to account for the temporal pattern of motor actions, differences between expert and novice performers and the effects of varying the cognitive demands of the task in a variety of particular ways.

The models will be developed within the domain of transcription typing. Initial versions will consist of schemata which deal with input and output and a control structure for regulating and coordinating the schemata. The model will produce, via computer simulation, the temporal sequence of keystrokes in any normal transcription typing task. The pattern of errors and interstroke intervals produced by the model will be compared to that of typical skilled typists. Later versions of the model will account for performance in a variety of different tasks involving

secondary tasks, speed-accuracy trade-offs, etc. The model will also account for other forms of data such as eye movements and incipient finger movements.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

6.0007, QUALITY ASSURANCE SYSTEM IN CLINICAL PRACTICE SETTINGS
P. Chang, Howard University, School of Medicine, *2400 6th St. N.W., Washington, District of Columbia* 20001 (NAS 5-23799)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

6.0008, STUDY OF SODIUM HOMEOSTASIS AND RENIN-ALDOSTERONE DURING WATER IMMERSION
M. Epstein, University of Miami, School of Medicine, Dept. of Medicine, *1400 N.W. 10th Ave., Box 520875, Miami, Florida* 33152 (NAS 9-15473)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

6.0009, STUDY OF PREDICTIVE ECOLOGICAL MODELS USEFUL FOR THE MANAGEMENT AND CONSERVATION OF BERING SEA MAMMALS
G.C. Ray, Johns Hopkins University, School of Hygiene & Public Health, Dept. of Pathobiology, *615 N. Wolfe St., Baltimore, Maryland* 21205 (NAS 2-9300)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0010, STUDY OF PERFORMANCE OF INSTRUMENTED MANIKINS IN MEASURING THERMAL PROTECTION
E.T. Waldron, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0F4280)

Determine sensitivity levels and data acquisition adequacy of instrumented manikins (both Air Force and Army developed) used to measure the thermal protection provided by aviators' and tankers' uniforms.

Utilize manikins instrumented with 'true' skin simulants and predict protection through standard techniques, such as equating burns with a damage integral of 1.0.

SUPPORTED BY U.S. Dept. of Defense, Natick Research & Development Command, Natick Development Center

6.0011, ELECTROPHORESIS SEPARATION (77-E)
A.J. Johnson, New York University, School of Medicine, Dept. of Medicine, *550 1st Ave., New York, New York* 10016 (NAS 8-33099)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

6.0012, RESEARCH STUDY OF NON-INVASIVE MONITORING OF CARDIO-PULMONARY FUNCTION
L.E. Farhi, State University of New York, Albany Campus, Graduate School, *1400 Washington Ave., Albany, New York* 12203 (NAS 9-15802)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

6.0013, SPATIAL RESOLUTION THRESHOLDS DURING THE COURSE OF DARK ADAPTATION
P. Sperus, Texas Tech University, School of Medicine, *P.O. Box 4340, Lubbock, Texas* 79409 (DA0C7888; DAMD17 77 C 7007)

The object of this research is to determine the visual capability of aircrew at different times during recovery from image intensifier adaptation. Optical image intensifiers serve to aid night vision by amplifying the amount of light reaching the retina. The result is an improvement of visual capability employing night vision devices. If the night vision device fails, as they do without warning, the operator will suddenly find himself visually impaired because of his elevated adaptation level. The time to full recovery of dark adapted vision varies from one to three minutes, depending upon the mean luminance preceding the device failure. This research will determine visual capability of the operator at different times during recovery from image intensifier adaptation.

The approach is to measure dark adaptation of five young adult males following adaptation to the chromaticity and luminance levels which span the range of the AN-PVS 5 night vision optical image intensifier. All experimental parameters will be nested in a 3 (viewing conditions) by 3 (pre-adaptation luminance) by 2 (background luminance) matrix design. Thus, contrast sensitivity functions for selected post-adaptation times generated by determining the contrast threshold at each spatial frequency for a given post-adaptation time can be determined.

SUPPORTED BY U.S. Dept. of Defense, Army, Medical Research & Development Command

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, MARSHALL MATED ELEMENT SYSTEM TRANSLATOR
M.A. Woodfin, Arizona State University, Graduate School, *Tempe, Arizona* 85281 (NAS 8-32230)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

7.0002, ADVANCED CIG DATA BASE DEVELOPMENT AND ANALYSIS
E.G. Monroe, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223760)

To enhance the capability of the advanced simulator for pilot training by providing the capability to generate and visually verify the computer image generation (CIG) data base in the offline mode. In addition, analyses of visual data base structures and advanced software algorithms will be performed. This will provide a broader base for behavioral research and facilitate man-machine interaction.

This effort will develop an automated approach to the generation of CIG visual data bases primarily through the development of software facilitating programs and the addition of interactive computer graphics equipment. The software will be used to generate and verify visual data base material in the offline mode through the use of the interactive graphics equipment. The first step is to complete the software to generate the visual data base. The second step is to install the computer graphics equipment and the third step is to complete the software for data base verification.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

7.0003, NONLINEAR PROBLEMS OF CONTINUUM MECHANICS AND MATHEMATICAL PHYSICS
M.S. Berger, Inst. for Advanced Study, *Princeton, New Jersey* 08540 (DF051360; AFOSR-78-3558)

AF function - aerospace vehicle design techniques. Deficiency -weight reduction and other optimization lead to large structural distortions which are not well understood. Objective - to improve the self consistency and rigor of existing mathematical techniques and create new ones. How work contributes - through more dependable mathematical models.

Nonlinear problems in continuum mechanics and mathematical physics exhibit unique properties such as solitons, or bifurcation which are important to future engineering design. Techniques to be applied include functional analysis, calculus of vari-

ations in the large, and a study of the singularities of mappings. Applications may be expected in areas including the structural stability and plasticity of thin shells, parametric instability and resonance for Hamiltonian autonomous systems, soliton perturbation, and superconductivity.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0004, PERIODIC OPTIMAL CONTROL PROBLEMS
J.L. Speyer, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: The object of this study is to understand and extend the mathematics involved in periodic optimal control problems. Presently, optimal periodic control theory is a somewhat unexplored field within the framework of optimization theory having important applications. One interesting application, the fuel optimality of airplane cruise, is used to help understand the complex nature of cyclic optimization problems. It is found in this second year of a two year project that the steady state cruise arc for a large class of aircraft is not minimizing. Attempts to solve this problem using standard numerical techniques have not been satisfying. This is due in part to these classes of problems being characterized by such mathematic pathologies as conjugate points and singular surfaces.

SUPPORTED BY University of Texas

7.0005, STRUCTURING IMAGE DATA - SUBSETTING, INDEXING, ACCESS AND COMPACTION
S.L. Tanimoto, University of Washington, School of Arts & Sciences, Dept. of Computer Science, *Seattle, Washington* 98105 (ENG79-09246)

Detailed digital images, coming from satellites and other sources in ever increasing numbers, contain data that are awkward to work with because of their bulk and a lack of convenient manipulating methods. This research program is studying methods to meet this need. The project is roughly divided into the following areas: 1) subsetting (deriving a relevant portion of the original image or set of images), 2) indexing (providing association mechanisms to speed access to desired pictorial information), and 3) compaction (new ways to reduce storage requirements for image data). The structure being investigated will aid in such standard problems as segmentation by thresholding, region growing, and edge analysis; correlation matching of images with terrain models; and computation of transforms such as the two dimension Fourier, Harr and Walsh-Hadamard.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, REMOTE SENSING WORKSHOP
T.H. Hughes, University of Alabama, School of Arts & Sciences, Dept. of Geology & Geography, *Box 1937, University, Alabama* 35486 (NAS 8-31979)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

8.0002, QUANTUM FLUIDS AND SOLIDS
A.L. Fetter, Stanford University, School of Humanities & Sciences, Dept. of Physics, *Stanford, California* • 94305 (DMR7825258)

The theoretical low-temperature research in this project will study liquid 3He. The investigation of the superfluid's internal structure will include the response and stability in the presence of hydrodynamic flow, the effect of confining walls, and the behavior when subjected to uniform rotation. In each case, the effect of a static magnetic field will be considered along with the utility of nuclear magnetic resonance as an experimental probe of these systems. The motion of ions in uniform liquid 3He will be analyzed in various regions of the phase diagram. This study will involve the linear behavior at low electric fields and also the nonlinear regime for both the normal fluid and the superfluid. In addition, the use of ions to study nonuniform textures in superfluid 3He will be investigated.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0003, COMPUTER SIMULATION OF PLASMAS
J.M. Dawson, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (PHY79-01319)

A program of computer simulation of plasma phenomena will continue at UCLA. This will include: 1) further investigations of the free electron laser; 2) collective acceleration of particles by intense electromagnetic waves propagating through plasmas; 3) plasma and heat transport across magnetic fields: 4) generalizations of the particle MHD models.

This is a continuation of research previously supported by NSF grant PHY76-83686A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0004, A KINETIC THEORY APPROACH TO THE MAGNETOSPHERIC ELECTRIC FIELD
E.C. Whipple, University of California, San Diego Campus, Inst. for Pure & Applied Physical Sciences, *P.O. Box 109, La Jolla, California* 92037 (ATM79-11875)

This grant will support a continued effort in investigating a kinetic theory approach to magnetospheric problems. The emphasis in the research will be to extend previous work in the areas of magnetospheric convection electric field, the boundary layer configuration of both electric and magnetic fields, and comparison with measured particle velocity distribution data from the ATS and SCATHA spacecraft. A zero-order self-consistent magnetospheric electric field model will be sought by populating particle trajectories with realistic velocity distributions at their source and studying the processes which would be required to maintain quasi-neutrality. Work on the idealized problem of a magnetic dipole in a flowing plasma will be extended to include more realistic flow velocities and possibly scattering processes. Specific phenomena in satellite data which relate to these theoretical studies will be analyzed. Examples of such phenomena are plasma injections, field-aligned fluxes, and plasma drop-outs.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0005, NUMERICAL PLASMA HYDRODYNAMICS
F.T. Adler, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

Many problems in plasma physics require the solution of the coupled hydrodynamic equations for ions, electrons, and neutral atoms. The existing numerical approaches are based either on direct simulation or on the use of the finite difference method; both methods require small time steps and large computation times. A Green's function method leading to simple integral equations has been developed for the one-dimensional case. In comparison to existing methods, the solution of these equations in terms of the Neumann series allows for a significant increase in the size of the time step without affecting the numerical stability of the procedure. Various analytical techniques have been developed and computationally tested for the necessary calculations of the kernels and their iterates of the integral equation.

SUPPORTED BY University of Illinois

8.0006, PARAMETRIC INSTABILITIES IN INHOMOGENEOUS PLASMAS

F.T. Adler, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

While instabilities in infinite homogeneous plasmas have been investigated extensively, only limited knowledge exists about the onset of parametric instabilities in inhomogeneous warm plasmas. These instabilities influence the absorption of the incident electromagnetic radiation in finite inhomogeneous laser target plasmas. In the hydrodynamic approximation, the threshold for the onset of such instabilities and their temporal growth rates has been calculated for typical warm, non-magnetic laser target plasmas. For this purpose a system of eigenfunctions has been developed for a simple (slab) geometry that leads to a rapidly converging coupled mode expansion. These temporal modes are coupled through the spatial variations in the amplitude of the incident electromagnetic wave. Both effects have been included in the calculation; in this manner, a limit for the validity of the customarily-used dipole approximation has also been obtained. The effects of a blow-off region surrounding a fully or partially ionized plasma subject to an intense electromagnetic field have been investigated along similar lines.

SUPPORTED BY University of Illinois

8.0007, DEEP IMPURITY LEVELS IN TERNARY SEMICONDUCTORS

J. Dow, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801 (DN775630; N00014-77-C-0537)

Future Navy electronics systems will require improved and new semiconductor materials. Increased understanding of the role of impurities in these materials will result in better material control, cheaper materials and new electron device application.

This research will further develop the theoretical and experimental understanding of the role of isoelectronic impurities in the ternary alloy III-V semiconductors. A phenomenological model has elucidated some of the mechanisms involved in the high efficiency photoluminescence of gallium arsenide phosphide. The deformation potentials for such impurities will be calculated for an anisotropic medium to remove part of the phenomenology of the earlier model. These will be used to calculate binding energies for various nitrogen-nitrogen pairs and to calculate exciton interactions. Alloy disorder, phonon interactions, and strain field (caused by impurities) effects will be studied in relation to photoluminescence intensities and line shapes. Concepts will be generated leading to improved photoluminescence efficiency in ternary alloy semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0008, PLASMA PHYSICS

M. Raether, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

Wave-wave Interactions - Studies of wave-wave interactions in an electron beam-plasma system led to the discovery of a spontaneous decay instability of a beam-plasma wave into an ion acoustic wave and an electron plasma wave. Good agreement was found with a theoretical model based on three wave coupling.

Statistical Properties of Plasma Turbulence - The objective of this research project is to obtain information about turbulent plasma states that goes beyond the traditional description of these states in terms of correlation functions and/or power spectra. A system has been constructed that allows the measurement of one and two point probability densities of electron density fluctuations in a field of ion acoustic turbulence in a low pressure discharge in helium.

SUPPORTED BY University of Illinois

8.0009, NUCLEAR SCATTERING AND NUCLEAR PROCESSES

D.G. Rawnhall, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

Experiments which probe the structure of atomic nuclei by scattering electrons from them are carried out at several labs, including Illinois, and research is done on the theory of the scattering process. While the basic mechanism is simple, current and future measurements require corrections to it and a continuing program for application of these corrections to experiment is carried on. The expertise developed is also applied to nuclear scattering of more strongly interacting particles, such as protons and pions. Simple nuclear models, which have been tested by such research, are applied to astrophysical situations in which the extreme temperatures or pressures involved modify drastically the role played by atomic nuclei. The current application is to an equation of state suitable for calculations of stellar collapse and possible supernova production.

SUPPORTED BY (No Supporting Organization Reported)

8.0010, LIGHT-SCATTERING STUDIES OF PHONON INTERACTIONS IN PIEZOELECTRIC SEMICONDUCTORS

R. Bray, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR79-14618)

Light scattering studies of acoustic phonons in opaque materials and Raman scattering studies of non-equilibrium electron and phonon populations will be carried out. In the first category, intense acoustoelectrically-amplified beams of phonons will be used to facilitate studies of phonons in opaque materials by three very different techniques: (a) Brillouin scattering of light for interactions occurring at the surface of the material rather than in the bulk, (b) X-ray scattering where optical opacity is by-passed, and phonons can be studied in the tail of the Bragg peak or by their effect on anomalous transmission, (c) The optical detection of solitary mechanical pulses and 'echoes'--a new phenomenon believed to be generated in acoustoelectric domains by a piezoelectric shock mechanism. In the second category, the whole Raman spectrum, including Rayleigh wings and one- and two-phonon structures, will be used as a probe of transient changes in electron and phonon populations due to such agents as intense laser flux providing extrinsic and intrinsic excitation, high electric fields, and acoustoelectrically amplified phonon domains which affect the carrier distribution and provide high ac strains and piezoelectric fields.

This research was previously supported by DMR76-82090-A01.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0011, ULTRASONIC AND RELATED INVESTIGATIONS OF SOLIDS

R.J. Sladek, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR79-08538)

Ultrasonic and related investigations of acoustic phonon behavior will be carried out for the purpose of relating it to the electrical conductivity and crystal stability characteristics of other phonons or the magnetic properties of crystalline solids exhibiting metal-insulator transitions. Included are electronic conductors and superionic conductors. Measurements will be made of the velocity and attenuation of ultrasonic waves as a function of temperature, pressure, and magnetic field at low temperature, and in some cases the thermal expansivity and/or electrical impedance (to determine optical phonon and/or electronic behavior).

It is also proposed to investigate thoroughly a new post-electric-field ultrasonic attenuation enhancement in arsenic triselenide glass, which provides evidence for carrier injection, trapping, and recombination processes and implies that the two-level tunneling systems responsible for ultrasonic attenuation are valence alternation pairs. The approach will involve heat treat-

ments of samples, characterization of the sample surface, study of infrared quenching of the excess attenuation and detection of recombination radiation and/or changes in conductance due to the high dc field.

This research was previously supported by DMR 7708476. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0012, ELECTRICAL NATURE OF DISLOCATIONS IN SEMICONDUCTORS

J.S. Ahearn, Martin Marietta Corp., Martin Marietta Laboratories, *1450 S. Rolling Rd., Baltimore, Maryland* 21227 (DMR79-11914)

Dislocations degrade the performance, reliability, and production yield of a wide range of semiconductor devices. Problems related to dislocations (which act as recombination centers, microplasma generation sites, and electrical shorts) have been found in Si devices, in III-V semiconductor LEDs and lasers, and in II-VI photoelectrolytic devices. However, despite their importance, the mechanism by which dislocations degrade device performance is not well understood. A major barrier to understanding is the absence of reliable, fundamental knowledge of the nature of the defect state introduced into a variety of semi-conducting materials by dislocations. The aims of this program are to provide basic information on dislocation interactions with charge carriers, and thereby contribute to a general understanding of detrimental effects of dislocations in semiconductor devices. The approach for investigating dislocation energy states and their interactions in semiconductor materials is to make the semiconductor the working electrode of an electrolytic cell. In this way, the charge residing in the dislocation level(s), other defect levels, the conduction band, and the valence band can be altered by changing the cell potential. The effects of altering the charge on these levels will be detected by dark current, photocurrent, capacitance, and dislocation velocity measurements as a function of applied cell potential. In addition, by introducing redox couples into the electrolyte, the effect of direct charge transfer from redox couples to dislocation levels on cell dark current, photo-current, and capacitance will be examined. This approach will be undertaken on a model material--the wide band gap semiconductor ZnO. This is a continuation of research previously supported under NSF Grant DMR78-05717, and is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0013, STUDY OF ATOMIC PROPERTIES OF ASTROPHYSIC IONS AND ATOMS

F.W. Martin, University of Maryland, College Park Campus, Graduate School, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (NCA 5-65)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0014, SIPLE LOW LIGHT LEVEL TV EXPERIMENT

R.H. Eather, Boston College, Chestnut Hill Campus, School of Arts & Sciences, Dept. of Physics, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (DPP78-23513)

An all-sky monochromatic imagery TV system will be designed, constructed, tested, and then installed at Siple Station during the austral summer of 1980-81 where it will be used to make observations during 1981 of proton and electron precipitation in the ionosphere caused by very-low-frequency wave interactions with these particles in the magnetosphere. The data obtained will be used to determine the size, shape, and location of the interaction regions in the ionosphere.

Logistics support is required for one person to visit Siple Station during the austral summer 1979-80.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

8.0015, MATHEMATICAL PHYSICS

A.M. Jaffe, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Physics, *Cambridge Station, Cambridge, Massachusetts* 02138 (PHY79-16812)

Theoretical research at the interface between mathematics and physics will be done. The work will focus on studies in quantum field theory, which is the basis for our understanding of the elementary particles, and in statistical mechanics. Specific topics will include: Lattice gauge theories, Classical gauge theories, Quark confinement, Anomalies in field theory, Functional determinants, Phase transitions, Non-linear maps on an interval, Constructive quantum field theory, 1/N expansion.

This is the first year of a three year continuing grant; previous research was supported under NSF grant PHY77-18762A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0016, METALLIC MAGNETISM - EFFECTS OF PRESSURE AND OF MAGNETIC IMPURITIES IN SUPERCONDUCTORS

R.P. Guertin, Tufts University, Medford Campus, School of Arts & Sciences, Dept. of Physics, *Medford, Massachusetts* 02155 (DMR79-06659)

Experiments will be performed to investigate single impurity and collective magnetic effects in intermetallic compounds and alloys. The experiments are divided into two groups: the measurement of magnetic properties at high hydrostatic pressures and in high magnetic fields, and investigations of magnetic impurity effects in superconductors at very low temperatures and at high pressures.

In the first category, measurements will be made of the magnetization and susceptibility of the weak ferromagnets praesodymium selenide and non-stoichiometric praesodymium phosphide. In ferromagnetic Uranium-thorium antimonide the application of pressure is expected to give rise to a ferroto paramagnetic transition accompanied by a valence charge for the uranium ion. Also, a search for diamagnetic anomalies in high pressure phase of cuprous chloride will be carried out. In the second category, studies will be made of magnetic effects of representative iron group, rare earth and actinide impurities in thorium and other superconducting hosts. Measurements of the superconducting-normal phase boundary as a function of high pressure for two re-entrant cerium impurity Kondo systems will also be performed

Research previously supported by DMR 7705959 A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, THEORY OF INTERACTIONS OF MESONS AND NUCLEONS WITH NUCLEI

M.M. Sternheim, University of Massachusetts, Amherst Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *Amherst, Massachusetts* 01002 (PHY77-07592 A02)

Research initiated under NSF grant PHY77-07592A01 on theoretical problems in the field of intermediate energy nuclear physics will continue.

Processes in which only incomplete information is obtained about the outgoing particles in an intermediate energy reaction are considered to be incoherent. The interference effects in a quantum mechanical calculation tend to cancel, so that semiclassical models are valid. The validity of various semiclassical approaches will be studied, and cross-sections for several processes of interest will be calculated.

Pion-nucleus scattering is described theoretically with the aid of an optical potential. Under the present NSF grant, it has

been shown recently that purely phenomenological approaches to finding this potential have serious ambiguities. The present program will study the comparison of theory and experiment in this area, with the goal of extracting nuclear information.

Finally, nuclear processes will be used to set limits on the masses of various particules hypothesized by particle theorists.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0018, ALIGNMENT AND ORIENTATION IN ATOMIC COLLISIONS

J. Macek, University of Nebraska, Lincoln Campus, School of Arts & Sciences, Dept. of Physics, *Lincoln, Nebraska* 68508 (PHY79-06348)

Research in theoretical atomic physics initiated under NSF grant PHY77-07110A01 will be continued. A comprehensive program of research will be carried out on the origins of alignment and orientation of collision excited states. Professor Macek will seek to understand the underlying physical mechanisms responsible for anisotropy by numerical studies of select collision systems including heavy ion collisions and electron-ion collisions using appropriate theoretical approaches. In addition, conversion of alignment to orientation by magnetic fields and the influence of relativistic effects in ion-atom scattering will be studied. The research will advance fundamental knowledge of atomic collision dynamics.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0019, DATA PROCESSING EQUIPMENT FOR FAR INFRARED FOURIER TRANSFORM SPECTROMETER

K.D. Moeller, Fairleigh Dickinson University, Teaneck Hackensack Campus, School of Liberal Arts, Dept. of Physics, *1000 River Rd., Teaneck, New Jersey* 07666 (PRM79-20946)

Research in the molecular spectroscopy laboratory includes: 1) Determination of optical constants of powdered materials. 2) Development of far-infrared band pass filters to be used aboard NASA's COBE (cosmic background explorer) satellite for the measurement of emission from the cosmos. 3) Measurement of the far-infrared absorption coefficient of various liquids, of interest for the study of molecular dynamics in liquids. 4) Internal rotation of CH3 group in methylamine and deuterated methylamine.

The grant provides funds for data processing equipment to improve the efficiency of a Fourier transform spectrometer for low resolution measurements in the very far infrared and millimeter region.

SUPPORTED BY U.S. National Science Foundation, Office of Planning & Resources Management

8.0020, NAVY ENVIRONMENT - IONOSPHERIC ELECTRIC FIELD

M. Brook, New Mexico Inst. of Mining & Technology, Graduate School, Dept. of Physics, *Campus Station, Socorro, New Mexico* 87801 (DN675282; N00014-76-C-0574)

The aim of this research is to measure horizontal gradients of the ionized upper strata of the atmosphere including the ionosphere. It is necessary to obtain this data with longer term measurements than is possible with balloons for improving the predictive capability of ionospheric models. Ionospheric modeling is needed for design and operation of naval communication and surveillance systems.

In a reasonably pollution free area (flat open space of New Mexico) a 10 km antenna will be strung at a height of seven meters and insulated from the ground. Horizontal gradients in the ionosphere are estimated to be 10 mv/m, which figure is attenuated by a factor of a thousand 7m above the ground. An antenna of 10 km length will aquire a voltage drop of one tenth of a volt, an adequate magnitude to measure.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0021, MULTIEXPERIMENTAL STUDIES OF THE WIND AND WAVE PATTERNS IN THE UPPER ATMOSPHERE AND IONOSPHERE

M.C. Kelley, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (ATM79-05549)

Under this grant, research will be supported in the areas of Space Plasma Physics, Planetary Electrodynamics, and Neutral Atmospheric Dynamics. The program stresses combining multiple techniques. Both passive and active experiments will be performed to study equatorial spread F. One experiment will utilize a double barium release to create an electrodynamic uplift, another will involve an ionospheric hole created chemically by burning of the Space Shuttle engines over the diagnostic incoherent scatter radars at Arecibo and also west of Peru. It is anticipated that the equatorial hole will drift eastward and hopefully upward, as happens with naturally occurring plasma holes or bubbles. The Millstone Hill radar will be utilized to search for and study large electric fields which occur near the ionospheric projection of the plasmapause and which can create east-west drifts of several km/s in a narrow latitude range (approximately 1 degree). Data there will also be combined with: that from an auroral radar probe located in Ithaca but which sees a volume common with the Millstone Hill radar; a whistler receiver; and airborne observations relating electric field measurements with auroral excitation data. The Arecibo and Chatanika radars will be utilized to examine gravity wave motions in the troposphere and lower stratosphere, in conjunction with balloon and rocket ascents to test wave-mean flow interaction theory. Such studies may help determine the importance of gravity wave sources and sinks in the redistribution of energy and momentum in the troposphere and stratosphere. The Arecibo studies of cumulus towers is directed at providing information on scales sizes, which would contribute to understanding cloud growth.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0022, OPERATION OF THE STONY BROOK NUCLEAR STRUCTURE LABORATORY

D.B. Fossan, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Physics, *Stony Brook, New York* 11790 (PHY77-10192 A02)

This work is the continuation of research carried out under National Science Foundation grant PHY75-11185A02. The program will center on a tandem Van de Graaff accelerator and associated experimental equipment. Major pieces of general equipment include a 30-inch precision scattering chamber, lithium drifted germanium and sodium iodide gamma-ray detectors, a superconducting magnet for nuclear moment measurements, as well as general-purpose electronics, oscilloscopes and multichannel analysers.

Studies will include measurements of g-factors and quadrupole moments of isomeric nuclear states, isomeric fission, intermediate structure in heavy-ion-induced reactons, macroscopic properties of nuclei and nuclear-atomic interactions. Studies of a superconducting linear accelerator are in progress aimed at providing additional acceleration capability.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0023, DEVELOPMENT AND CONSTRUCTION OF A SUPERCONDUCTING HEAVY-ION LINEAR ACCELERATOR

P. Paul, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Physics, *Stony Brook, New York* 11790 (PHY79-12300)

This work is the logical extension of work presently in progress under NSF grant PHY76-80960 A01. Some related development work is also in progress at the California Institute of Technology under a separate grant, PHY79-09773.

The work consists of further development and construction of a superconducting booster accelerator for a model FN

Tandem Van de Graaff. The completed project will include a major upgrading of the accelerator including new accelerator tubes, a new-chain type charging system and a new high energy ion source. The post accelerator will consist of three bunchers, one before and two after the Van de Graaff accelerator, and eleven acceleration modules each of which consists of a cryostat containing several accelerating structures of the split ring type.

The accelerator will provide routinely and continuously 2.5 MV per meter of acceleration and may be run for shorter periods (up to a day) at 3.0 MV per meter using reserve helium supplies.

The work will include: 1) finalized design and manufacture of cryostats; 2) production and lead plating of split ring resonators; 3) assembly and testing of modules; 4) design of control computer system. Required magnets, beam lines, computer control systems and related hardware will be purchased and installed.

This is the first increment of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0024, STATISTICAL MECHANICS OF THE LIQUID STATE

G. Stell, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Physics, *Stony Brook, New York* 11790 (CHE79-00838)

This grant supports research under the Structural Chemistry and Thermodynamics Program for theoretical studies of the liquid state using statistical mechanical methods. Thermodynamic, structural, and transport properties characteristics of the liquid state and of its phase boundaries will be investigated. Four broad topics will be emphasized: (1) the structure and thermodynamic properties of ionic solutions with particular attention to the higher valence aqueous electrolyte regime, (2) the thermodynamic and dielectric effects of long-range forces in molecular liquids, (3) a general statistical mechanical investigation of polydisperse systems, and (4) the transport properties of liquid mixtures using the revised Enskog theory as a starting point.

This research is a continuation of that currently supported by Foundation Grant, DMR-7307580.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, CURRENT CONTROLLED LIQUID PHASE EPITAXY

E.K. Stefanakos, University of North Carolina, North Carolina Agricultural & Technical State University, Graduate School, *N. Dudley St., Greensboro, North Carolina* 27411 (DMR77-19210)

This research will be a study of semiconductor crystal growth by current controlled liquid phase epitaxy (LPE), a method of producing high quality junctions and uniform epitaxial layers. The work will concentrate on the mechanisms responsible for the growth of epitaxial layers by current flowing across the semiconductor-melt interface. Two possibilities are: (a) diffusion of solute atoms to the interface in the presence of a temperature gradient, and (b) differential ion migration resulting from momentum exchange between electrons and solute atoms. The temperature and temperature gradient at the interface will be carefully measured by introducing thermocouples at about 0.5 mm intervals from the interface. This method will be used to grow epitaxial layers of indium arsenide on indium arsenide, indium phosphide on indium phosphide and gallium indium arsenide on indium phosphide.

After growth, specimens will be cleaved and examined with a phase contrast microscope to determine interface uniformity, thickness of grown region and presence of any strictions due to current pulses. In addition, Schottky barrier methods will be used for profile measurements.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0026, NUCLEAR MAGNETIC RESONANCE STUDIES OF ORIENTATIONAL ORDER IN LIQUID CRYSTALS

J.W. Doane, Kent State University, School of Arts & Sciences, Dept. of Physics, *Hilltop Dr., Kent, Ohio* 44240 (DMR79-04393)

A unique feature of the liquid crystalline phase of matter is that the molecules or parts of the molecules remain oriented throughout a single domain while maintaining a high degree of mobility. It is this feature which gives the biological membrane its ability to function and which provides for the use of liquid crystals in display devices. Liquid crystal phase transitions observed in thermotropic materials as well as those observed in the lamellar bilayer of membranes and simple soaps are accompanied by subtle but important differences in the molecular orientational order. Orientational order is, therefore, an important feature of liquid crystals, yet is probably one of the least understood aspects of these phases because only a few experimental techniques are sufficiently perceptive to measure and characterize it. One of the most useful techniques in this regard is nuclear magnetic resonance (NMR). NMR is sensitive not only to the orientational order of a molecule as a whole, but also to that of its individual segments.

In the present work, various orientational order parameters are measured using NMR. The principal goal is to test microscopic models and theories that have been offered for several of the liquid crystal phases. These include the smectic phases of the thermotropic systems, and the newly discovered lamellar phases of the lyotropic systems. Some of the measurements involve high pressure techniques.

First year of a three-year continuing grant; renewal of work supported by DMR76-21365.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0027, THEORETICAL STUDIES OF NON-UNIFORM MANY-BODY SYSTEMS

W.F. Saam, Ohio State University, Columbus Campus, School of Mathematics & Physical Sciences, Dept. of Physics, *164 W. 17th Ave., Columbus, Ohio* 43210 (DMR79-06934)

Research previously supported by DMR7521866.

Theoretical research, involving developments and applications of density-functional (DF) theory for non-uniform systems will be carried out. In addition, we propose studies of such systems using techniques other than DF theory for purposes of comparison of different theoretical approaches. Specifically: 1. Calculations designed to test the reliability of a sequence of new approximate DF theories which we have recently developed. This project involves both comparisons of predictions of the new theories among one another and with results of Monte-Carlo calculations recently undertaken in our group. 2. Completion of work on a DF theory of phase-separation in binary mixtures of classical Lennard-Jones fluids. Self-trapped electron states in these mixtures will also be explored. 3. Further work on the subject of phase nucleation in 3He-4He mixture systems.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0028, STUDIES IN GENERAL RELATIVITY THEORY

L. Witten, University of Cincinnati, Graduate School, Dept. of Physics, *305 Physics Bldg., Cincinnati, Ohio* 45221 (INT78-25663)

This collaborative effort between physicists at the University of Cincinnati and the Universidad Central de Venezuela is concerned with the discovery and study of the properties of exact solutions of the Einstein equations for sources that may be fluid or electromagnetic.

Three main subdivisions of the research are: (1) solution generation of the Einstein-Maxwell equations, including a comparative exploration of conserved quantities in the Yang-Mills theory; (2) examination of the properties of several specific solutions, such as those relating to collapsing systems. An understanding of the behavior of physically realistic collapsing systems is of great importance in astrophysics, and closely related problems are important in cosmology; (3) studies in general relativistic magnetohydrodynamics, focussing on force-free magnetic fields and the properties of conducting fluids in the presence

of strong electromagnetic and gravitational fields. These are relevant to the process of gravitational collapse in ordinary stars, and the production of radiation from a pulsar.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0029, CHARACTERIZATION OF THE OPTICAL PROPERTIES OF LASER AND PHOSPHOR CRYSTALS 16182-P

R.C. Powell, Oklahoma State University, School of Arts & Sciences, Dept. of Physics, *Agricultural Hall, Stillwater, Oklahoma* 74075 (DA0G8984; DAAG29-79-G-0048)

To better characterize and understand dynamical processes such as energy transfer and radiationless relaxation transitions in laser and phosphor materials. Relevance - this research is directly related to on-going efforts of the laser division of the night vision and electro-optics lab. In particular the characterization of dynamical processes such as energy transfer and concentration quenching in neodymium laser materials is of prime concern for the future design of laser rangefinder, mini-laser rangefinder and designator systems. The work on neodymium pentaphosphate, which is a precursor stoichiometric compound laser material, is essential to the development of future neodymium stoichiometric compound lasers.

Along with standard optical spectroscopy methods, the techniques of time-resolved spectroscopy, site selection spectroscopy, and photoacoustic spectroscopy will be applied to the study of laser and phosphor materials including neodymium pentaphosphate, neodymium doped yttrium vanadate, and neodymium doped lanthanum bryllate. In addition, coherent transient spectroscopy techniques will be developed to investigate coherent motion contributions to exciton migration and coherence destroying collision processes of ions in crystals.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0030, NOVEL LOW-DIMENSIONAL CONDUCTORS

M.M. Labes, Temple University, School of Liberal Arts, Dept. of Chemistry, *Broad St. & Montgomery Ave., Philadelphia, Pennsylvania* 19122 (DMR79-05979)

Intense efforts are currently under way to understand the relationship between crystal structure, chemical formula, and the highly directional physical properties of so called low-dimensional solids. Several molecular and polymeric 'metals' or semiconductors of this type have been prepared and studied, both theoretically and experimentally, in the last few years. It is highly desirable to synthesize new materials designed specifically to test theory and extend the range of phenomena observed, possibly creating totally new classes of conductors.

Three types of novel low-dimensional conductors will be prepared and studied. Hydrocarbon-halogen complexes are of interest because Professor Labes and coworkers have discovered that perylene 4 iodine has a metallic temperature dependence of its conductivity and may not be a simple segregated stock complex. Understanding its properties may result in a basic revision of the guidelines for the structure of metallic charge transfer complexes. Second, a class of channel-like inclusion compounds is of interest because both significant fast ion and electronic conductivity have been observed in these compounds. Last, this group is investigating the synthesis and properties of a new polymeric system and its charge transfer adducts which show promise of high conductivity.

This is the first year of a three-year continuing grant; renewal of work supported by DMR 77-01055.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0031, DESIGN AND STUDY OF NEW FERROELECTRIC ORGANIC POLYMER FILMS AND CRYSTALS

A. Garito, University of Pennsylvania, School of Arts & Sciences, Dept. of Physics, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (DA0F1846; DAAK70 77 C 0045)

To synthesize and investigate polymers for pyroelectric, piezoelectric, and non-linear optical properties.

In order to achieve a maximum unit dipole charge on each molecular unit, a parallel sequence of charged dipoles arranged along individual polymer chains, and a parallel stacking of each polymer chain with respect to other chains in the solid, the solid-state polymerization of appropriately substituted diacetylenes will be used. The diacetylenes will have one electropositive and one electronegative substituent to get a maximum push-pull effect.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Night Vision & Electro Optics Lab.

8.0032, COOPERATIVE STUDIES OF RELATIVISTIC FREE-FREE TRANSITION PROCESSES

R.H. Pratt, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (INT79-00982)

This award provides travel funds for Dr. Richard H. Pratt, University of Pittsburgh, to cooperate with Dr. H.-K. Tseng, National Central University, Taiwan, on the study of the elementary process of bremsstrahlung, electromagnetic radiation produced by the sudden retardation of an electrical particle (as an electron or positron) in an intense electric field. Specifically the project concerns calculation of relativistic free-free transitions in the field of atoms and ions in the energy region around the bremsstrahlung edge, an energy region higher than that usually considered by atomic physicists and far too low to be considered by high-energy physicists. A comparison will be made between theoretical and experimental results on the basis of calculations using the partial-wave method of assessing radiative processes in this region. The information sought is of considerable potential interest to branches of physical sciences such as plasma- and astrophysics, and is pertinent through radiation hazards to public health, as well as to the generation of energy through fusion. Previous support for related work was provided by NSF award OIP-7503599.

The project has been approved under the U.S.-Taiwan Cooperative Science Program, and the Taiwan investigator will receive support for his participation in the project from the National Science Councilor equivalent counterpart agency.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0033, OPTICAL STUDIES OF ELECTRONIC STATES, VIBRATIONS AND RELAXATION PROCESSES IN AMORPHOUS SYSTEMS

J. Tauc, Brown University, Graduate School, Dept. of Physics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DMR79-09819)

Studies will be carried out of electronic states in amorphous silicon doped with noble and transition metals, and of photoinduced optical absorption in amorphous hydrogenated silicon, silicon-germanium, and silicon-carbon systems. A subpicosecond mode-locked dye laser system will be used to study three relaxation processes in the picosecond range on amorphous hydrogenated silicon (and related materials) and/or chalcogenide glasses: dynamics of photoexcited absorption at the band edges, relaxation of a photoexcited state into the luminescent state and relaxation of Raman excitations, in particular as a function of temperature when the material passes through the glass transition.

This research was previously supported by DMR 7617443 A02.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, INTERACTION OF SLOW ELECTRONS WITH HIGH-PRESSURE GASES (QUASI-LIQUIDS)
L.G. Christophorou, University of Tennessee, Knoxville Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (006842)

Our work on the interaction of slow electrons with molecules in dense gases will continue with emphasis on atmospheric pollutants such as CO2, H2S, NO2. Accurate measurements of the rates and the cross-sections for attachment of slow electrons to molecules at various pressures and in various media will provide effective ways to elucidate the collision kinetics of electron-molecule interaction processes. Such information is necessary for understanding physicochemical reaction pathways in the atmosphere and helpful in unifying the modeling of gas-phase phenomena with those in the condensed phase. In addition, knowledge on slow electron-molecule interactions, especially on negative-ion states, is synthesized.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

8.0035, HIGH VELOCITY COLLISIONS OF HIGHLY IONIZED IONS WITH ATOMS AND MOLECULES
I.A. Sellin, University of Tennessee, Knoxville Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (PHY79-07344)

This activity includes a variety of accelerator-based atomic physics experiments concerning collisions of high velocity, highly ionized particles with target atoms, molecules, and solids (foils). The work is to be carried by a group of university users at major accelerator facilities at Oak Ridge, Brookhaven, Berkeley, Darmstadt (Fed. Rep. of Germany), and occasionally other sites. Specific experiments include but are not limited to: (1) investigation of the forward peak in electron emission accompanying ion-atom and ion-solid collisions; (2) delineation of the role of single vs. multiple electron excitation processes in the formation of the forward peak and in other collision processes by means of studying such collision events in coincidence with final ion scattering state; (3) auxiliary investigation of very low energy Auger electron emission arising from ion-atom and ion-solid collisions through use of the same coincidence techniques; (4) completion of an extensive study of electrostatic fine structure (delta n equals 0) transition probabilities in foil-excited ions; (5) study of orbital angular momentum state coherence in ion-atom collisions.

This is the first year of a three-year continuing grant, previously supported under NSF grant PHY77-05726.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0036, EXCITATION OF X-RAYS WITH ENERGY BELOW 1.5 KILOELECTRON VOLTS
H.D. Fetzer, St. Marys University, School of Arts & Sciences, Dept. of Physics, *2700 Cincinnati, San Antonio, Texas* 78228 (U-515)

Low energy characteristic x-rays excited by accelerated charged particles are being investigated. A new target chamber to accomodate a variable geometry end-window flow proportional counter has been developed and built. X-rays ranging in energy down to Titanium L, 0.45 KeV, excited by 150 KeV protons have successfully been observed with the proportional counter.

Different proportional counter end-windows are being tested to provide greater transmission of x-rays lower in energy than those already observed.

For the energy of charged particles involved (up to 150 KeV) and the energy of the x-rays being investigated target surface conditions are critical. Various methods are being tested for target surface cleaning. Argon-ion bombardment, or sputtering, appears to hold the most promise at present.

The efficiency of excitation of x-rays below 1.5 KeV by protons and electrons will be compared for particle energies ranging from 75 KeV to 150 KeV.

SUPPORTED BY Robert A. Welch Foundation

8.0037, NB3SN FORMATION KINETICS IN FILAMENTARY COMPOSITE SUPERCONDUCTORS
K.M. Ralls, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: In a continuing program we are investigating the formation kinetics of Nb3Sn in composite wires consisting of a niobium filament within a tin-bronze matrix. Previous work has established that small amounts of zirconium in the niobium filament increase the kinetics of Nb3Sn layer growth. Current studies are being conducted to see if this enhancement continues when larger amounts of zirconium are present.

SUPPORTED BY University of Texas

8.0038, PIONEER F/G DATA ANALYSIS OF THE SOLAR TERRESTIAL RELATIONS PORTION OF THE MAGNETIC FIELD EXPERIMENT
D.E. Jones, Brigham Young University, School of Physical & Mathematical Sciences, Dept. of Physics & Astronomy, *B-166 A S B, Provo, Utah* 84601 (NAS 2-7358)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0039, MANY-BODY METHODS WITH APPLICATIONS TO ATOMS AND MOLECULES
H.P. Kelly, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (PHY79-08241)

Research in theoretical physics initiated under NSF grant PHY77-07154 will be continued and expanded. Many-body calculations of atomic and molecular properties will be emphasized. Detailed studies of correlation effects on parity nonconservation calculations will be made for a number of atoms using relativistic atomic orbitals. Relativistic calculations including correlations will also be made for many other atomic properties of heavy atoms.

Photoionization calculations will be carried out for many systems including relativistic effects and electron correlations. Studies will be made of resonance structure in photoionization cross-sections with particular attention to transition metal and rare earth atoms. Photoionization cross-sections will also be calculated for core levels, for excited states, and for certain molecules. The process of double photoionization will be studied further. Multi-photon cross-sections will be studied as well as effects of electric and magnetic fields on photo cross-sections.

Studies will also be made of other properties including Auger rates, generalized oscillator strengths, and optical potentials for electron scattering.

This is the first year of a four-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0040, ACQUISITION OF EQUIPMENT FOR STUDIES OF SHOCK WAVES IN SOLIDS
G.E. Duvall, Washington State University, School of Arts & Sciences, Dept. of Physics, *Administration Bldg., Room 101, Pullman, Washington* 99163 (DMR78-17809)

This grant will provide funds to upgrade the facilities of the Shock Dynamics Laboratory at Washington State University. A laser velocity interferometer will be acquired for measuring surface motion in complicated geometries, with the ability to record velocity-time histories of impulsively loaded specimens.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0041, REMOTE DETECTION OF ACCELERATOR-PRODUCED NEUTRINOS
P. Kotzer, Western Washington University, Bureau for Faculty Research, *Bellingham, Washington* 98225 (DN775423; N00014-77-C-0363)

The objective is to study the basic interactions and properties of high energy accelerator-produced neutrino beams at sites in the ocean, thousands of kilometers from the source, and to assess the potential of neutrino communication schemes for naval applications. Work involves the fundamental aspects of neutrino physics and environmental problems related to undersea neutrino detector arrays. This includes a study of the response characteristics and associated electronics of a linear array of prototype undersea Cerenkov detector modules to neutrino induced events when placed in line with the FERMILAB's neutrino beam.

The approach is to use existing accelerator facilities such as the Fermi National Accelerator Laboratory (FNAL) located near Chicago to produce narrow beams of high energy neutrinos for transmission experiments in water targets using Cerenkov detectors and time-of-flight techniques. Theoretical and experimental investigations are made of the fundamental aspects of neutrino physics including electron-muon neutrino oscillations, neutrino decays, neutrino-nucleon differential cross-sections and neutrino velocity. This includes work on understanding the principal sources of background to the Cerenkov mode of detection including sunlight, trace radioactivity, bioluminescence, and cosmic rays.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0042, THEORY OF ANISOTROPIC MAGNETIC PROPERTIES AND ASSOCIATED LATTICE BEHAVIOR IN ACTINIDE AND RARE EARTH MATERIALS

B.R. Cooper, West Virginia University, School of Arts & Sciences, Dept. of Physics, *Morgantown, West Virginia* 26506 (DMR79-07069)

Research previously supported by DMR7706721.

Theoretical research will be carried out on the magnetic properties of actinide and rare earth materials. A major focus will be on cerium and actinide monopnictides of the sodium chloride structure. By introducing covalent interations between the conduction and the localized f-electrons, the remarkably anisotropic equilibrium and dynamic magnetic properties of these materials will be investigated. Secondly, a study of fluorite-structure oxides will examine important questions of correlataion between magnetic behavior and lattice structural changes. Finally, other materials with related lattice and anisotropy effects will be studied. These will include praseodymium selenide, rare earth intermetallics and calcium or yttrium doped zirconia. Close coordination with experimental programs will be maintained.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0043, PHOTOACOUSTIC AND PHOTOTHERMAL SPECTROSCOPY OF IONS IN SOLIDS 16176-P

W.M. Yen, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Physics, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DA0G8996; DAAG29-79-C-0040)

Development and application of photoacoustic and photothermal spectroscopy to the study of impurity ions in crystalline and glassy solids. Relevance - relevant to the design of future rare earth ion laser and solid state upconversion devices for mini-rangefinder applications.

Recent developments in photoacoustic and photothermal spectroscopy will be applied to the study of impurity ions in crystalline and glassy solids. Studies will include (1) measurements of quantum efficiencies and multiphonon relaxation of optical transitions, (2) intermodulation of photoacoustic signals for level isolation and (3) photocooling effects.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0044, COSMIC RAY SHOWERS

K.E. Turver, University of Durham, Dept. of Physics, *South Rd., Durham, England, United Kingdom* (DA0D9345; DAERO 77 G0068)

To observe and study the atmospheric 'Cerenkov' radiation produced by cosmic ray showers.

To undertake field observations in the next several months on the range at Dugway Proving Ground, Dugway, Utah. This will be joint between the University of Durham and University of Utah.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Research & Standardization Group

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, FEASIBILITY OF COMMUTER AIRLINE SERVICE IN RURAL ALASKA

L. Gorsch, University of Alaska, Fairbanks Campus, Graduate School, *Fairbanks, Alaska* 99701 (0045023; ED-62-450-02-01-X1)

OBJECTIVE: Drawing on experience with studies of rural ambulance services, rural rental housing and similar services, develop a methodology to evaluate the economic feasibility of commuter air service in rural Alaska, which can be used by local businesses, local decision makers and federal agencies. Field test this methodology in selected Alaskan communities.

APPROACH: Develop procedures to estimate costs of providing commuter air service including, but not limited to, capital expenditures, labor, and other operating expenses such as airport usage fees, insurance and business services. Develop a procedure to estimate receipts from commuter air service. Field test these procedures to the feasibility of providing commuter air service in selected Alaskan communities which differ in social, economic and geographic characteristics.

SUPPORTED BY U.S. Dept. of Agriculture, Economics Statistical & Cooperative Service, Economic Development Div.

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, PHOTOELECTRIC OBSERVATIONS OF LUNAR OCCULTATIONS

N.M. White, Lowell Observatory, *P.O. Box 1269, Flagstaff, Arizona* 86001 (AST79-16150)

Photoelectric timings of occultations of stars by the Moon are an inexpensive way of providing basic data necessary to monitor changes in and improve the accuracy of the orbital elements of the Moon. The timings will enable the most accurate determination of the Moon's position relative to the stellar frame of reference. Photoelectric observations of 'shadow' diffraction pattern which sweeps across the surface of the Earth as the Moon passes in front of a star will provide the highest angular resolution yet obtained of multiple stellar system and diameters of stars cooler than the Sun. This resolution is equivalent to measuring the diameter of a dime 1,000 miles away. These observations will provide basic data which bear directly upon fundamental astrophysical and cosmological questions. The full potential of this program is being realized by a continuing observational program over a number of years at several observing sites.

Prior support was by NSF grant AST 76-82248A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0002, RADIO OBSERVATIONS OF THE SUN AT CENTIMETER AND MILLIMETER WAVELENGTHS
H. Zirin, California Inst. of Technology, Graduate School, Dept. of Astrophysics, *1201 E. California Blvd., Pasadena, California* 91109 (ATM79-06345)

This grant will support a program of research in solar radio astronomy at cm and mm wavelengths. The objectives are the determination of the properties of high energy electrons in solar flares and active regions, and to understand the radio emission of the quiet sun at cm and mm wavelengths. Interferometeric observations at Owens Valley Radio Observatory (OVRO) and the Very Large Array (VLA) will provide high spatial and time resolutions (0.1 sec and 4.6 arcsec at OVRO; 10 sec and better than 1 arcsec at the VLA). Cooperative observations with other radio observatories will also be undertaken. The specific programs listed are: (1) Analysis of data already in hand from a VLA run on flares, and several cooperative, multifrequency runs on flares, involving determination of the location and spatial distribution of the radio sources as a function of time, and compared with the active region magnetic fields. (2) New flare observations with 0.1 sec time resolution at OVRO. (3) Joint observation programs at different frequencies, including collaboration with the Flare Buildup study, the Solar Maximum Year and the SMM project. (4) Reduction of data expected to be obtained on the February 1979 eclipse. (5) VLA observations of solar flares. (6) Observations of the solar brightness distribution at 1.3 mm with the OVRO 10 meter mm dish. (7) Exploration of the solar atmosphere by solar occultation of radio sources at cm wavelengths.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0003, STUDIES OF RICH CLUSTERS OF GALAXIES
G.O. Abell, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California* 90024 (AST78-25648)

This project is a continuation of a study of rich clusters of galaxies with the following specific objectives: 1) completion of a photographic survey of southern clusters, the plates for which are being taken at Siding Spring, Australia; 2) preparation and publication of a new catalog of clusters of galaxies, consisting of corrections and annotation of the northern hemisphere catalog and a supplementary southern hemisphere section; 3) investigation of the distribution in space of the southern clusters and comparison of them to the northern clusters; 4) a detailed investigation of one or two southern superclusters; 5) completion of measurement of existing plates from the 48 inch Schmidt telescope on Mt. Palomer, California, of several rich clusters to obtain distributions in space and luminosity; and 6) study of the distributions in magnitude of faint galaxies by use of the COSMOS machine at Edinburgh, Scotland, which gives position, size, orientation, shape, and brightness of the images of the galaxies on the photographic plates.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0004, MEASUREMENT OF STELLAR PARALLAXES AND PROPER MOTIONS
A.R. Upgren, Wesleyan University, Graduste School, Dept. of Astronomy, *Middletown, Connecticut* 06457 (AST77-26554 A02)

Continued support is for the observation, measurement and reduction of astrometric plates to obtain parallaxes and proper motions of dwarf and subdwarf stars, mostly of spectral classes F through M. The program stars include nearby field dwarf stars taken from the McCormick lists as well as a number of similar members of the Hyades and Ursa Major clusters. A considerable number of nearby subdwarfs, mostly of classes F and G, have also been placed on the program. One of the continued aims of the program is the study of physical and kinematical characteristics of stars on the lower main sequence of the spectrum-luminosity diagram. Several investigations have already been completed which intercompare these properties for the K and M dwarf stars. Similar studies will be carried out as more parallaxes are determined. Two major studies show that the K-M dwarf stars of widely different ages, Hyades and field stars alike, define the same main sequence, but not the same local standard of rest. Young-disk stars have a collective outward motion (away from the galactic center) with respect to old-disk stars. Parallax errors will be studied. Prior support was by NSF grant AST 77-26554.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0005, P-MODE OSCILLATIONS OF THE SUN AS A PROBE OF LARGE-SCALE SOLAR ACTIVITY AND SOLAR-TERRESTRIAL RELATIONS
R.F. Howard, Carnegie Inst. of Washington, Hale Observatories, *1530 P St. N.W., Washington, District of Columbia* 20005 (ATM78-20420)

This grant is for the construction of a ground-based instrument which will be dedicated to the seismic probing of solar structure on a regular basis. Specifically, it will facilitate extensive digital observations of the solar photospheric velocity field in order to measure temporal variations in the photospheric and subphotospheric solar rotation rates on time scales ranging down to one day. In addition to studying solar rotation these observations will also permit an investigation of other aspects of the solar velocity fields, such as possible acoustic oscillations generated by solar flares, meridional flows, or variations in the amplitude and frequency of the solar p-mode oscillations themselves. Such observations will improve our knowledge of how solar variations affect our terrestrial environment.

The system to be used will utilize the existing 60-foot solar telescope at Mount Wilson, the telescope with which the 5-minute oscillations were discovered, and its associated spectrograph. Practically all the time on this telescope will be available for these observations. Large blocks of observing time are essential for the research project to be undertaken with this instrument. An integral part of the proposed system is a data processing system which will have sufficient speed and core capacity to carry out both the real-time observing and later data reduction tasks at the telescope on a daily basis. Subsequent analysis will be equally important to solar physics and solar-terrestrial relations.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0006, A FINDING LIST FOR OBSERVERS OF CLOSE BINARIES (5TH EDITION)
F.B. Wood, State University System of Florida, University of Florida, School of Arts & Sciences, Dept. of Astronomy & Physics, *208 Tigert Hall, Gainesville, Florida* 32601 (AST78-07507 A01)

Support is for a new edition of the Finding List for Observers of Eclipsing Variable Stars; the 1963 edition of which has been an anachronism for more than 5 years. The editors contemplate a substantial broadening of the content of the Finding List so that it will more properly refer to close binaries, rather than only eclipsing variables. The source materials for the compilation are kept up to date at the University of Florida where the revision will be prepared. Camera-ready copy and the concomitant writing of the Finding List contents on magnetic tape will be undertaken for early publication and wide distribution.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0007, SOLAR RADIO PLASMA PHYSICS
D.G. Wentzel, University of Maryland, College Park Campus, School of Engineering, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (ATM79-16583)

Active regions of the solar corona that lead to flares also experience many smaller instances of energy release. The coronal magnetic fields generally maintain themselves in a nearly unstressed state through these smaller energy releases. They involve plasma physics similar to those in flares, and they lead to localized heating and motions that may be observable by experiments on the Solar Maximum Mission. Moreover, they set the scene in which, occasionally, energy builds up to a flare. This award will support a theoretical investigation of these smaller energy releases; radio observations and plasma physics should combine to yield models of the sites of energy release and possible SMM-observable consequences, and they may indicate why energy releases generally are small but sometimes accumulate to cause a flare. The main evidence for the energy releases is provided by (1) type I solar radio bursts, whose very intense and localized emission suggests the presence of plasma waves and anomalous magnetic dissipation, (2) large solar radar signals, which seem to require rather intense plasma waves in many parts of the active-region corona, and (3) storm-type III radio bursts, the beginning and ends of which can yield information on the electron beams that cause the radio bursts. All three phenomena are correlated with active regions in which flares occur and thus relate to the criteria for flare build-up. The overall aim is to apply plasma theory to the situations described above in order to test the idea that small energy releases in the corona result from plasma waves. This will contribute to our understanding of energy flow from the sun.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0008, SOLAR RADIO PROGRAMS AT THE HARVARD RADIO ASTRONOMY STATION

A. Maxwell, Harvard University, Cambridge Campus, Harvard College Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (ATM77-21453 A02)

This grant provides support for the continuation of a program in solar radio astronomy started under NSF Grant ATM77-21453. The primary aim of the program is the investigation of shock waves, generated by intense solar flares, as they propagate outward through the solar corona and then into the interplanetary medium.

Observations will be made of solar radio bursts of spectral type II, which are important diagnostics for the initial stages of the outward propagation of the shocks generated by flares. The radio data on the shocks will be compared with computer simulations of the passage of fast-mode magnetohydrodynamic shocks in the solar corona. The radio information and the computer simulations will then be compared with the characteristics of the shocks in the interplanetary medium, as determined by satellite observations.

The radio observations will be made at the Harvard Radio Astronomy Station, Fort Davis, Texas, with dynamic spectrum analyzers covering the frequency band 25-580 MHz.

This program forms part of the international Study of Travelling Interplanetary Phenomena (STIP), which in turn will form part of the international program for the Solar Maximun Year (SMY) when it commences in August 1979.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0009, A COMPLETE SURVEY OF GALAXY REDSHIFTS TO MV EQUALS 14.5 USING A PHOTON-COUNTING DETECTOR ARRAY

M. Davis, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (AST78-24856)

A two-line photon-counting detector array copied from the original design of Dr. S. Shectman has been constructed. The device is well suited for faint object spectroscopy and has been in nearly continuous use since February 1978 for a variety of scientific programs at Mt. Hopkins, Arizona. The primary emphasis is on the undertaking of a complete survey of the redshifts of all galaxies in the Northern Sky with mv less than 14.5 and galactic latitude greater than 40 degrees. The first results from the survey are encouraging and other exciting recent observations have been made. The completed redshift catalog will provide unique data for research in extragalactic astronomy. Intended uses of the catalog include: I) improved understanding of the kinematics and dyanmics of galaxies within approximately 100 megaparsecs of the Milky Way, 2) direct measurement of the galaxy covariance function using the redshift as a distance indicator, and 3) improved determination of the luminosity distribution of galaxies and hence the luminosity density of galaxies. These questions are of direct relevance to the cosmological debate of whether the Universe is open or closed, and the result of the survey will play an important role in resolving the issue.

This is a continuation of AST-7622675.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0010, ASTRONOMICAL STUDIES RELATED TO OCCULTATIONS

J.L. Elliot, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (AST79-08376)

Occultations provide rare opportunities to obtain unique information about the outer planets of our solar system, as well as other astronomical objects. Based on occultations recently observed the following research projects will be carried out: A. Astrometric Analysis of the Uranian Rings - The main goal of the astrometric analysis of the Uranian rings is to determine the orbits of the nine rings; their semi-major axes, eccentricities, inclinations, and precession rates. B. Radius and Oblateness analyses of the occultation data by carefully examining how the uncertainty in the exact position of the ring center and the thermal structure in the atmosphere could cause systematic errors in the results. It is also proposed to determine whether the value for the oblateness is consistent with the value of J2 obtained by Nicholson et al from the precession of the e ring. C. Temperature Variations in the Uranian Atmosphere - It is planned to prepare for publication the results on the temperature structure of the Uranian atmosphere obtained from the Cape data, and to study the possible dynamic models that would explain the temperature variations discovered in the Uranian atmosphere. The Uranian atmosphere will be compared to that of the other planets.

Prior support was by NSF grant AST 76-14832.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, SOLAR SYSTEM DYNAMICS

F. Franklin, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (31P-4P50-09)

With the aid of computer simulation of the solar system, and using traditional analytical methods of celestial mechanics, the evolution of the system of asteroids is studied. The hypothesis under test is that the asteroids were initially distributed uniformly from Mars to Saturn and beyond, and that the present distribution, which is confined to a relatively narrow belt between Mars and Jupiter, is the remnant of a much more extensive configuration. The bulk of the asteroids are hypothesized to have been removed by planetary perturbations, by physical collisions, and by aerodynamic drag of gas in the primeval solar nebulae. We are also beginning a search for isolating integrals of the elliptic restricted three body problem (using the method of surfaces of section) as another and powerful method of checking this hypothesis.

SUPPORTED BY Smithsonian Institution, Astrophysical
Observatory

10.0012, ASTROMETRIC OBSERVATIONS OF COMETS AND ASTEROIDS AND SUBSEQUENT ORBITAL INVESTIGATIONS

R. McCrosky, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (NGR 09-015-212; 163663-31P)

Perform ground-based astrometric observations of comets, asteroids and planets of particular interest to NASA.

Evaluate field plate reduction as compared to use of usual astrographic catalogs.

Will perform orbital computations and examine 'nongravitational' anomalies of comets.

Astrometric observations of objects fainter than m equals 15 are photographed with the 61" reflector of the George R. Agassiz Station of the Harvard College Observatory.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0013, STELLAR PHYSICS

C. Whitney, Smithsonian Institution, Astrophysical Observatory, Solar & Stellar Physics Div, *60 Garden St., Cambridge, Massachusetts* 02138 (31S-4S50-04)

I have recently initiated a theoretical and observational program on extended stellar atmospheres, their structure and stability. Using a very general non-LTE atmosphere, I have begun a study of the thermal stability of the solar chromosphere and the atmospheres of B stars. My immediate purpose is to correct a substantial error in the latest published study of this problem by including the effects of radiative ionizations and departures from pure radiative equilibrium.

I am preparing an observational program to collect spectrum data on shell stars and binary systems containing a B star and an M supergiant (VV Cephei systems). These data will be analyzed with the non-LTE program.

In a related program, I am examining thermal dissipation through tidal distortion in close binary systems.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0014, OBSERVATIONAL AND THEORETICAL STUDIES OF INTERSTELLAR MOLECULAR CLOUDS

P. Solomon, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Astronomy, *Stony Brook, New York* 11790 (AST78-25021)

Observational and theoretical studies of molecular clouds will be carried out in the following areas: 1) giant molecular clouds in the galaxy and external galaxies; 2) observations of molecular cloud cores; 3) deuterium in interstellar molecular ions; and 4) theoretical research on the dynamics of molecular clouds. The observations and analyses of these past few years have shown that giant molecular clouds are the major components of interstellar matter and the proposed new research emphasizes investigations that may lead to an understanding of the dynamics and evolution of the clouds, the most massive objects in the galaxy. The observations primarily at millimeter wavelengths will be carried out principally at the Five College Radio Astronomy Observatory (FCRAO) new 45 foot millimeter wave antenna; the 36 foot antenna of the National Radio Astronomy Observatory and the 15 foot University of Texas antenna. The State University of New York at Stony Brook has provided substantial equipment for the FCRAO antenna and will have 20% of observing time available plus 15% for joint projects. Theoretical investigations will concentrate on energetic phenomena in molecular clouds and their effect on the cloud dynamics and evolution.

This is a continuation of AST-7611209AO1.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0015, INFRARED OBSERVATIONS OF THE GALACTIC ABUNDANCE GRADIENT

J.L. Pipher, University of Rochester, School of Arts & Sciences, Dept. of Physics & Astronomy, *260 Crittenden Blvd., Rochester, New York* 14627 (AST78-12393)

Infrared observations of lines of heavy metals in young nebulae in our galaxy, the Milky Way, will be made. From these observations, we expect to observe whether a gradient in the abundance of the heavy metals exists as a function of distance from the center of the galaxy. These metals have been added to the interstellar gas by virtue of various mass loss mechanisms from older stars in the neighborhood, which have produced heavy elements in their interiors through nuclear reactions. In order to understand the evolution of the galaxy, we need to know the magnitude of the gradient. The research will be done in collaboration with airborne observers using the NASA C-141 airborne observatory.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0016, ANALYSIS OF ULTRAVIOLET STELLAR SPECTRA OBTAINED WITH SKYLAB EXPERIMENT S-019

K.G. Henize, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NAS 8-31459)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

10.0017, SPECTROPHOTOMETRY OF VARIABLE QUASI-STELLAR OBJECTS

H. Netzer, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST78-15916)

Spectrophotometric observations of variable quasi-stellar objects (QSOs) will be made using modern digital detectors at McDonald Observatory. Variations in the emission-line strengths on a monthly time scale will be searched for and any such changes will be correlated with changes in the QSO continuum radiation. The results should put further constraints on theoretical models of QSOs.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0018, THE EVOLUTION AND DYNAMICS OF EXPLODING STARS

J.C. Wheeler, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (AST78-23326)

Several lines of evidence indicate that the progenitors of some supernovae may be helium stars of moderate or extreme hydrogen deficiency. The structure and evolution of helium stars and their possible connection to supernovae will be explored.

Some supernovae may explode within the dense confines of molecular clouds. Calculations which explore the outcome of such events will be made. A number of different cases will be considered. These will range from the case where the supernova takes place within a very dense cloud to the case where the explosion occurs in a cluster of young stars that has already formed. In the latter case the explosion may sweep away the remnant molecular gas surrounding the cluster.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0019, MEASUREMENT OF SOLAR ULTRAVIOLET SCATTERED LIGHT IN THE STRATOSPHERE AND DEDUCTION OF J-VALUES

L.L. Jensen, Utah Higher Education System, Utah State University, Center for Research in Aeronomy, *Main Bldg., Office 104, Logan, Utah* 84321 (ATM78-17616)

Solar ultraviolet radiation dissociates molecules in the stratosphere and thereby initiates a complex chain of chemical reactions that determines the composition of the stratosphere, including the concentration of stratospheric ozone. In addition to the direct component of the solar ultraviolet, there is a substantial contribution to dissociation from scattered ultraviolet radiation. This research will measure the scattered flux at altitudes up to about 40 km with a balloon-borne spectrometer. The experimental results will be used to check the validity of single-scattering and multiple-scattering theoretical models and to calculate photodissociation rates based on the scattered fluxes. A search will also be conducted for unique atmospheric volumes where deviation from normal scattering occurs, possibly because of the presence of particulate material.

SUPPORTED BY U.S. National Science Foundation,
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of Atmospheric Sciences

10.0020, SCIENTIFIC INVESTIGATIONS IN SUPPORT OF THE SPACE TELESCOPE PROJECT

D.J. Schroeder, Beloit College, Graduate School, Dept. of Physics & Astronomy, *Beloit, Wisconsin* 53511 (NAS 8-32901)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
George C. Marshall Space Flight Center

10.0021, AN INVESTIGATION OF THE CHEMISTRY, EXCITATION, AND DISTRIBUTION OF INTERSTELLAR AND CIRCUMSTELLAR POLYCYANOACETYLENES

E.B. Churchwell, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Astronomy, *500 Lincoln Dr., Madison, Wisconsin* 53706 (AST79-05578)

A two year program to investigate possible chemical pathways of interstellar polycyanoacetylenes will be carried out. The approach will be an empirical determination of the distributions and column densities of several simpler molecular species thought to be important precursors of cyanoacetylene (HC3N) in several small dark cloudlets where HC3N and heavier cyanoacetylene species are observed to be abundant. Equal importance is placed on the relative distributions of reactants and products as on their column densities since spatial coincidence can in some cases be an important test of chemical pathways. Specifically, the presence of cyanide, cyanic acid, and acetylene radical will be mapped to compare with the ammonia, HC3N and cyanodiacetylene distributions in several cloudlets in the Taurus region. High resolution spectra will be taken and the data reduced to analyze the dynamics and radiative transfer of line emission in these clouds. It appears that some condensations in the Taurus complex are enhanced in HCnN species. This question will be investigated further by searching to low noise levels for HCnN species outside the Taurus region. Recent detections of molecules in the infrared source IRC-10216 indicate that HCnN species are generally enhanced in carbon stars with extensive envelopes. Excitation of HCnN species is expected to be different in carbon star envelopes than in dark clouds. It seems important to pursue this further by searching for HCnN species in other carbon stars with fairly large infrared excesses. There will also be similar projects carried out which are related to the chemistry of interstellar molecules.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
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of Astronomical Sciences

GENERAL

11.0001, OPERATION OF A STATE TECHNOLOGY APPLICATION CENTER

Unknown, State University System of Florida, *Tallahassee, Florida* 32306 (NASW 3060)

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01 AERONAUTICS (GENERAL)

N80-14017# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ADVANCES IN GUIDANCE AND CONTROL SYSTEMS USING DIGITAL TECHNIQUES
Aug. 1979 357 p refs In ENGLISH and FRENCH Presented at the Guidance and Control Panel Symp., Ottawa, 8-11 May 1979
(AGARD-CP-272; ISBN-92-835-0247-7) Avail: NTIS HC A16/MF A01

The application of digital methods to guidance and control systems is considered. Functional design concepts, trends, and requirements, advances in analytical and design techniques, and advances in digital system design and architecture to assure high integrity are among the topics covered. Data processing and computation techniques, software design validation techniques, including simulation, and operational and system development experience are included. For individual titles, see N80-14018 through N80-14043.

N80-14018*# Milco International, Inc., Huntington Beach, Calif.
STATE OF THE ART FOR DIGITAL AVIONICS AND CONTROLS, 1978 **c06**
Richard K. Smyth *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 20 p refs (For primary document see N80-14017 05-01)
(Contract NASw-2691)
Avail: NTIS HC A16/MF A01 CSCL 02A

A brief summary of a comprehensive state of the art survey is presented. The survey includes five broadly applicable technology areas: flight path management, aircraft control systems, crew station & human factors, integration & interfacing technology, and fundamental technology. In addition the survey included military technologies which have a technology transfer potential to the five broadly applicable technology areas. J.M.S.

N80-14019# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Flight Control Div.
A FLIGHT CONTROL SYSTEM USING THE DAIS ARCHITECTURE **c08**
A. P. DeThomas and R. A. Hendrix *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The development of a digital flight control system simulation capability to examine advanced integrated control architectures, in order to increase system performance and availability, is described. Near term issues, such as multiplexing interfaces with other avionics functions and structuring of software, are covered. J.M.S.

N80-14020# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
TRENDS IN DIGITAL DATA PROCESSING AND SYSTEM ARCHITECTURE **c80**
A. A. Calloway *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 5 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The utilization of airborne digital computers and methods for their integration into digital avionic systems are discussed. The architecture of two aircraft systems, one designed in the 1960s and one in the 1970s is described. The growth in complexity is discussed in terms of two factors: the total flow of data between the subsystems which form the elements of the system, and the total volume of the computing task in terms of the number of words of program required. Techniques which may assist in alleviating the growing complexity are then considered. These include: design management aids, such as requirement statement languages; architectural considerations, such as multiplex data busses and distributed processing; and software techniques, such as high level languages, MASCOT, and structured programming. J.M.S.

N80-14021# Societe Crouzet, Valence (France).
A METHOD FOR DESIGNING MULTIPROCESSOR ARCHITECTURES FOR AVIONICS FUNCTIONS [METHODOLOGIE DE CONCEPTION D'ARCHITECTURES MULTIPROCESSEURS POUR DES FONCTIONS D'AVIONIQUE] **c60**
C. Aleonard, A. Demoment, P. Romand, J. Gillon (CERT, Toulouse, France), and J. F. LeMaitre (CERT, Toulouse, France) *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 7 p In FRENCH (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

A digital technique is given for the design of high performance automatic systems. The evolution of digital techniques presents the automatist with the problem of the total design of a control system. It means going beyond algorithmic synthesis from the beginning, to take into account all the functional and operational aspects. Thus, it is possible to optimize the control system according to three important criteria: regard for the desired operating performances, the total cost, and the very important matter of operational safety (reliability, security, maintainability, and availability). Transl. by A.R.H.

N80-14022# Singer-Kearfott, Wayne, N. J.
FORTRAN FOR AVIONICS **c06**
Austin J. Maher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 8 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The approach taken to address the use of high order languages (HOL) is described. A review is presented of the interim languages stipulated by the DOD and the reasons for selecting FORTRAN as the basis of a compiler activity to provide competitive HOL capability. The rationale for selecting the oldest and least modern of the six interim languages, and the design approach to select a suitable language dialect for efficient implementation of avionic software without violating the stipulations of the ANSI Standard for FORTRAN are included. The success is described of the

effort to develop a low-cost compiler for the FORTRAN dialect which generates a highly efficient object code in the tradition of the many highly efficient FORTRAN compilers which have been developed for commercial computers. F.O.S.

N80-14023# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

AN OBSERVER SYSTEM FOR SENSOR FAILURE DETECTION AND ISOLATION IN DIGITAL FLIGHT CONTROL SYSTEMS c08

Norbert Stuckenberg *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

For the sensor part of a flight control system a sensor failure detection and isolation concept is presented based on analytic redundancy. A conventional triplex sensor system is replaced by a duplex sensor system without loss of the fail-operational property. In the case of a sensor failure, deterministic Luenberger observers provide the information about which of the two sensors of the duplex system actually failed. The proposed concept is applied to a command and stability system of a flight control system. Author

N80-14024# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).

AUTOMATIC RECOVERY AFTER SENSOR FAILURE ONBOARD c06

Marc Laberrere, Marc Pelegrin, and Marc Pircher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

Two techniques are developed which provide reliable failure detection and isolation for a dual-redundant subset of sensors. A global procedure using a bank of stationary Kalman filters is described. Some difficulties of this technique lead to a sub-optimal procedure which is developed in order to give all the dynamic and static relationships between the measured outputs on the aircraft. These techniques are sucessfully applied to simulated sensor failure on a six degree of freedom aircraft simulation and are applying to sensor failures injected on flight data from the N262 aircraft. F.O.S.

N80-14025# Marconi Avionics Ltd., Rochester (England). Flight Automation Research Lab.

RECENT ADVANCES IN FIBRE OPTICS FOR HIGH INTEGRITY DIGITAL CONTROL SYSTEMS c08

R. P. G. Collinson *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 16 p (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

The methods for using fiber optic cables for interconnecting the elements of an active control system, and the advantages and disadvantages are discussed. The major factors in the use of fiber optics are practical ones, connectors, terminations, ruggedness, and environmental capability of cables. The techniques are described which were developed to make a fiber bundle a practical cable link. The use of multi-access optical highways, particularly for interfacing other systems with the flight control system, (e.g. Air Data and IN systems) is reviewed and principles of the candidate networks outlined. Finally, a new concept for a fiber optic multi-access network is presented which is fully compatible with the new data transmission specification. F.O.S.

N80-14026# General Dynamics/Fort Worth, Tex.

REDUNDANCY MANAGEMENT CONSIDERATIONS FOR A CONTROL-CONFIGURED FIGHTER AIRCRAFT TRIPLEX DIGITAL FLY-BY-WIRE FLIGHT CONTROL SYSTEM c08

John H. Watson, William J. Yousey, and James M. Railey *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 23 p ref (For primary document see N80-14017 05-01)

(Contract F33615-77-C-3036)

Avail: NTIS HC A16/MF A01

To preclude the shut down of the flight control computers for control configured fighter aircraft, redundant (parallel) processing is used in conjunction with redundancy management concepts. Using reliability requirements and goals as expressed in loss-of-control per flight hour, a digital flight control system architecture is evolved with specific emphasis placed on the input, processor and output subsystems. The incorporation of an analog cross strapping of lower reliability sensors is shown to be an effective means of increasing system reliability by retaining sensor redundancy after a computer failure. A technique called control law reconfiguration is developed which insures system survival after a second like sensor failure. Computer contribution to loss-of-control is reduced by the addition of system monitors which increase the computer self-test confidence level. The resultant architecture is shown to have an inherent reliability which is relatively insensitive to the configuration of the actuator interface, thus allowing this interface to be designed based on hardware/software complexity tradeoffs. A.R.H.

N80-14027# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.

FAILURE DETECTION, ISOLATION AND INDICATION IN HIGHLY INTEGRATED DIGITAL GUIDANCE AND CONTROL SYSTEM c08

Wolfgang J. Kubbat *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 17 p (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

A broad spectrum of modern failure detection and isolation techniques is discussed and it is shown that the failure problem can be significantly reduced with technology and design. Several advanced methods such as vector redundancy, dissimilar redundancy, and methods applied to computers are described and some are backed up by practical examples. Data bus orientated guidance and control systems are considered. Based upon a practical realization example, guidelines are given for the use of MIL STD 1553 B in redundant applications. A.R.H.

N80-14028# Electronique Marcel Dassault, St. Cloud (France).

THE INTEGRITY OF ONBOARD COMPUTER PROGRAMS: A SOLUTION [L'INTEGRITE DES LOGICIELS EMBARQUES: UNE SOLUTION] c06

G. Germain *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 8 p refs In FRENCH (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

A solution is provided for insuring the integrity of the operating system onboard aircraft and engines. The principle effect is to increase the security of the system so as to make it homogeneous with that of the material, which in the case considered, is very high. Interesting consequences are found in the level of reliability and maintainability of the system, as well as the costs of validation. The means used are the simplest and most economical possible. They are applied to the structure of the operating system and hardware of a computer well adapted for onboard applications. Emphasis is placed on mechanisms for controlling address, which prevents all untimely destruction of the software. Transl. by A.R.H.

N80-14029# Hamilton Standard, Farmington, Conn.

A REDUNDANT INERTIAL NAVIGATION SYSTEM FOR IUS c18

R. A. Baum, G. E. S. Morrison (Boeing Aerospace Co., Seattle, Wash.), and R. C. Feters (Aerospace Corp., Los Angeles, Calif.) *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

A high-performance strapdown redundant inertial navigation system (RINS) being developed for the space transportation system inertial upper stage (IUS) is described and an overview of the test results obtained to date is presented. The IUS RINS is the first navigation system specifically designed to provide a fully redundant configuration with self-contained redundancy management algorithms which will permit the system to experience an in-flight failure and then automatically detect, isolate, and eliminate the field element and continue the mission without loss or out-of-specification degradation of the guidance function. A.R.H.

N80-14030# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse de Systemes.
DEFINITION OF THE HIERARCHICAL NETWORK FOR AGGRESSIVE ENVIRONMENTS (RHEA) c32
M. Buis, J. C. Laprie, J. Marco, and D. R. Powell *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 15 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The transmission level of a dependable data communication support system intended for the reliable and survivable interconnection of data processing units (subscribers) in an aggressive environment is described. The functional and dependability specifications of this system lead to the definition of a hierarchical architecture using a network-structured, damage and fault-tolerant global transmission medium and star-structured, fault-tolerant local transmission media. The contention method is used for control of access to the transmission media. A standard transmission-medium/subscriber interface is defined that implements an associative addressing scheme in order to cater for data broadcasting modes and facilitated dynamic system reconfiguration. Throughout the design, a top-down approach was adopted with the use of qualitative and quantitative evaluations at each level in order to make motivated choices among the different possible solutions. A.R.H.

N80-14031# Defence Research Establishment, Ottawa. (Ontario).
DEVELOPMENT OF AIDING GPS/STRAPDOWN INERTIAL NAVIGATION SYSTEM c04
D. F. Liang, D. B. Reid (Lapp (Philip A.) Ltd., Toronto), R. H. Johnson (S and S Software Ltd., Ottawa), and B. G. Fletcher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 15 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

An overview is presented of the design and development of an integrated multisensor navigation system comprised of a NAVSTAR GPS receiver, an aiding strapdown inertial navigation system (ASIN) and a number of auxiliary sensors, namely, air data and strapdown magnetic sensors. In the present phase, comprehensive software packages were developed to simulate all the subsystems used. A modular and computationally efficient Kalman filtering algorithm was designed and implemented for the integration of the GPS and ASIN. During the course of the development, two techniques were developed. An exact algorithm was derived to transform inertially referenced data into geographic coordinates. Also, a dual channel attitude algorithm was formulated which increases the bandwidth of the attitude computation in the strapdown navigator. Other routines developed include the baro-damping algorithm, auxiliary sensor processing and calibration routines. To provide a baseline level of performance, simulation results were obtained for future flight testing of the hardware. M.M.M.

N80-14032# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).
DIGITAL ARRAY SIGNAL PROCESSING TECHNIQUES APPLIED TO GUIDANCE AND NAVIGATION c32
S. Bloch *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 13 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

Spatial filtering, in particular virtual beam forming techniques, appropriate for guidance and precision landing operations, is discussed. Systems operating at L-Band are described demonstrating that when appropriate digital signal processing is applied, accuracy comparable to that of corresponding C-Band systems is achievable. Thus, the advantages of relatively low L-Band frequencies, may be exploited while maintaining a high degree of precision. M.M.M.

N80-14033# McMaster Univ., Hamilton (Ontario).
MICROCOMPUTER-BASED ON-LINE STATE ESTIMATION WITH APPLICATIONS TO SATELLITES c13
N. K. Sinha, S. Y. Law (Commun. Res. Centre, Ottawa), and R. Mamen *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The use of a Luenberger-type observer with an adaptive filter is discussed for estimating the states of a nonlinear system from the noise-contaminated measurements of the output of the system. The proposed method requires much less computation than the extended Kalman filter and, therefore, can be implemented more easily on a microcomputer. Application to the determination of the orbital states of the unified state model of a satellite is considered. Author

N80-14034# Twente Univ. of Technology, Enschede (Netherlands). Dept. of Electrical Engineering.
METHODS FOR STRAP-DOWN ATTITUDE ESTIMATION AND NAVIGATION WITH ACCELEROMETERS c04
R. P. Offereins and M. J. L. Tiemego *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 20 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

Methods are presented for calculating the attitude of a vehicle from the signals of three linear and three angular accelerometers which are rigidly attached to the vehicle. Also course, velocity and position measurements relative to some object can be used. Apart from the attitude, the velocity and position, with respect to this object, are also obtained as output signals. In fire control systems, filters for target position prediction and attitude determination can be combined in this way. M.M.M.

N80-14035# Contraves Italiana, Rome.
DIGITAL SIGNAL PROCESSING TECHNIQUES IN A MONOPULSE TRACKING RADAR c32
U. Fazio, F. Ambrosioni, and C. DeBonis *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

A description of a special-purpose Signal Processor is given. Since the Processor is highly flexible, it can be applied in a wide range of modern ground or ship-borne tracking radars, such as, Fire Control Radar for rockets or for conventional artillery (ground or anti-aircraft), Instrumentation Radar, and Tracking Radar for Command to line-of-sight missile guidance. Illustrated are the three main functions of the processor, considered as being associated to a fully-coherent monopulse radar: signal enhancement based on an FFT (Fast Fourier Transform) algorithm, tracking errors computation and system logic control. A description is given, especially as regards the FFT part, of the practical realization of each block, based on a wide use of the most modern digital techniques and of microprogrammed controls in particular, that have enabled high flexibility and growth potential to be obtained. In the description, it can be seen how the design trade-off costs/performances have led to the predominant use of well-known techniques and widely used electronic circuitry, excluding custom components. M.M.M.

N80-14036# Lockheed-Georgia Co., Marietta.
AN ASSESSMENT OF AND APPROACH TO THE VALIDATION OF DIGITAL FLIGHT CONTROL SYSTEMS c08
D. B. Mulcare and W. G. Ness *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

Flight-critical digital flight control system functions are evaluated in the context of farther term implementations. The quality and safety associated with fault tolerant, highly integrated, control oriented system implementations are emphasized. Technology needs are addressed so that the verification and validation process for advanced digital flight control systems can be sufficiently developed and purposefully accomodated in system engineering methodologies. K.L.

N80-14037# Electronique Marcel Dassault, St. Cloud (France).
THE AVIONICS COMPUTER PROGRAM: PRACTICAL EXPERIENCES WITH A METHODOLOGY [LOGICIEL AVIONIQUE: EXPERIENCES PRATIQUES D'UNE METHODOLOGIE] c06
J. Perin *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 17 p In FRENCH (For primary document see N80-14017 05-01)

Avail: NTIS HC A16/MF A01

The organization and methodology used in the construction of operating systems in the principle computers of the Mirage F1 and Mirage 200 aircraft are described. Particular emphasis is placed on the definition phases and program validation.

Transl. by A.R.H.

N80-14038# Westland Helicopters Ltd., Yeovil (England).
EXPERIENCE IN PRODUCING SOFTWARE FOR THE GROUND STATION OF A REMOTELY PILOTED HELICOPTER SYSTEM c08
J. P. Webby, P. L. Wescott, M. I. Tucker, and H. M. Smith *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

A computer system to control the aircraft, produce graphic displays, and handle data received from the aircraft was produced using the Modular Approach to System Construction, Operation, and Test, written in CORAL 66 language. The overall design of the software and the methods used to design, code, and test the software system are described in detail. K.L.

N80-14039*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SIMULATION USE IN THE DEVELOPMENT AND VALIDATION OF HIMAT FLIGHT SOFTWARE c61
Albert Myers *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01 CSCL 09B

The use of real time simulation in the development and validation of flight software for the highly maneuverable aircraft technology (HiMAT) remotely piloted research vehicle is described. Four simulations are interfaced with varying amounts of actual flight hardware to produce dynamic system operation. K.L.

N80-14040# Raytheon Co., Bedford, Mass. Missile Systems Div.
FEDERATED MICROCOMPUTER SYSTEMS FOR ONBOARD MISSILE GUIDANCE AND CONTROL c15
Frank J. Langley, David S. Siegel (ONR, Arlington, Va.), Wayne F. Savage (NSWC), and Rollin E. Wehman *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 15 p refs Sponsored by ONR and NSWC (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

Modular digital missile guidance and control systems were analyzed, structured, and built using standard industry microprocessors/microcomputers and associated memory and input/output interface components. The types of missiles considered were air-to-air, ship-to-air, and ship-to-ship, while the guidance and control functions analyzed were target seeker signal processing, seeker head control and stabilization, state estimation, guidance laws, autopilots, ramjet engine throttle control, warhead fuzing, telemetry, and self test. Federal microcomputer systems were found to support hardware modularity at the system level, and a set of 'macrofunction' microcomputer modules provided the desired flexibility at the component level. K.L.

N80-14041# Societe d'Applications Generales d'Electricite et de Mecanique, Paris (France).
COPRA: A NEW LINE OF ULTRARELIABLE RECONFIGURABLE COMPUTERS DESTINED FOR ONBOARD AEROSPACE APPLICATIONS [COPRA: UNE LIGNE NOUVELLE DECALCULAETEURS RECONFIGURABLES ULTRAFIABLES DESTINEE AUX APPLICATIONS AEROSPATIALES EMBARQUEES] c60
C. Meraud and F. Browaeys *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 23 p In FRENCH (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

A computer with automatic parallel reconfigurable organization, COPRA covers a gamut going from a redundant monoprocessor (200 kops/sec) to reconfigurable multiprocessors (400, 600, and 800 kops/sec). A model was constructed and a prototype is under development. It corresponds to a double-duplex configuration capable of surviving at least a first complete breakdown, as well as transitory breakdowns of a transparent kind during programming, which considerably simplifies the development of the application operating system. The microprogrammed means for error detection and for automatic recovery and reconfiguration are explained. Some technical aspects, notably the use of CMOS on SOS, are discussed. Some uses are predicted on a supervisory level for facilitating the programming of degradation of the mission. A Markov model permits a precise estimation of reliability which, for the configuration being developed, will be in the neighborhood of 95% over 5 years, with an undetected error rate on the order of 10 to the minus 10 power per hour. Transl. by A.R.H.

N80-14042# Litton Systems (Canada) Ltd., Rexdale, (Ontario).
A HIGH ACCURACY FLIGHT PROFILE DETERMINING SYSTEM c05
Peter Roy Vousden and Peter Jonathon Gollop *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 16 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

The characteristics of a system that determines the flight profile of an aircraft in three orthogonal coordinates to an accuracy of a few feet are described. A standard commercial quality inertial navigation system provides the required aircraft dynamic and attitude data while a special infrared sensor provides periodic updates. A digital computer implements an 18 state Kalman filter for estimation of the inertial errors. Filter data is stored on magnetic tape for immediate reprocessing by a fixed interval Bryson-Frazier smoothing algorithm that further refines the system performance. The techniques, applied in real time, are controlled in a multitask environment by a software operating system. Applications for the systems capability are discussed with emphasis on the initial purpose of providing an accurate self contained trajectory measuring system for ILS and MLS flight checking. Other uses such as airborne surveying and weapon release determining systems are examined. A.W.H.

N80-14043# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
INTEGRATION OF FLIGHT AND FIRE CONTROL c05
Robert K. Huber *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

An evaluation of an integrated flight and fire control (IFFC) system in modern fighter aircraft is described. The IFFC systems for air to air gunnery, air to ground gunnery, and bombing are outlined. The concept involves the coupling of fire control commands into the flight control system. The concept will be tested on a F-15B aircraft. Primary modifications to the F-15B aircraft include the addition of a digital computer for flight control and fire control signal processing, an electro-optical tracker, and a 1553A multiplex bus for communication between the F-15 central computer, the tracker, and the added digital computer. The IFFC concepts, the planned hardware implementation on the F-15B, and safety of flight considerations are discussed.

A.W.H.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N80-14044 Virginia Univ., Charlottesville.
MAGNUS EFFECT ON SPINNING BODIES OF REVOLUTION Ph.D. Thesis
Dinesh Satyaprakash Joshi 1979 94 p
Avail: Univ. Microfilms Order No. 7927978

A numerical finite difference method is developed to solve the three dimensional laminar/turbulent boundary layer equations on a spinning body of revolution at an angle of attack in supersonic flow. Influence of asymmetric transition and the presence of mixed boundary layers is considered to predict Magnus forces

and moments. Several contributions to the Magnus effects are considered. These include asymmetric boundary layer displacement thickness, centrifugal pressure, and primary and cross flow wall shear stress. Dissert. Abstr.

N80-14045*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SONIC-BOOM WAVE-FRONT SHAPES AND CURVATURES ASSOCIATED WITH MANEUVERING FLIGHT
Raymond L. Barger Dec. 1979 30 p refs
(NASA-TP-1611; L-13339) Avail: NTIS HC A03/MF A01 CSCL 01A

Sonic-boom wave shapes and caustic lines generated by an airplane performing a general maneuver are studied. The equations are programmed for graphical output as a perspective view of the wave shape. This quasi three-dimensional presentation provides a qualitative insight into the effects of the maneuver on the wave shape and the caustic locations. For the special case of planar maneuvers, the principal curvatures of the wave front are derived. These curvatures are needed to calculate the sound field in the vicinity of a caustic. The results of the analysis are applicable not only to sonic-boom studies but also to the calculation of noise generated by a supersonic rotor or propeller blade tip. Author

N80-14046*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC CHARACTERISTICS AT LOW REYNOLDS NUMBERS OF SEVERAL HEAT-EXCHANGER CONFIGURATIONS FOR WIND-TUNNEL USE
William G. Johnson, Jr. and William B. Igoe Dec. 1979 54 p refs
(NASA-TM-80188; L-13307) Avail: NTIS HC A04/MF A01 CSCL 01A

In response to design requirements of the National Transonic Facility, aerodynamic tests were conducted to determine the pressure-drop, flow-uniformity, and turbulence characteristics of various heat-exchanger configurations as a function of Reynolds number. Data were obtained in air with an indraft flow apparatus operated at ambient temperature and pressure. The unit Reynolds number of the tests varied from about 0.06 x 10 to 6th power to about 1.3 x 10 to 6th power per meter. The test models were designed to represent segments of full-scale tube bundles and included bundles of round tubes with plate fins in both staggered and inline tube arrays, round tubes with spiral fins, elliptical tubes with plate fins, and an inline grouping of tubes with segmented fins. Author

N80-14047*# Nevada Univ., Las Vegas.
TWO DIMENSIONAL AERODYNAMIC INTERFERENCE EFFECTS ON OSCILLATING AIRFOILS WITH FLAPS IN VENTILATED SUBSONIC WIND TUNNELS
Joseph Fromme, Michael Golberg, and John Werth Washington NASA Dec. 1979 150 p refs
(Grant NsG-2140)
(NASA-CR-3210) Avail: NTIS HC A07/MF A01 CSCL 01A

The numerical computation of unsteady airloads acting upon thin airfoils with multiple leading and trailing-edge controls in two-dimensional ventilated subsonic wind tunnels is studied. The foundation of the computational method is strengthened with a new and more powerful mathematical existence and convergence theory for solving Cauchy singular integral equations of the first kind, and the method of convergence acceleration by extrapolation to the limit is introduced to analyze airfoils with flaps. New results are presented for steady and unsteady flow, including the effect of acoustic resonance between ventilated wind-tunnel walls and airfoils with oscillating flaps. The computer program TWODI is available for general use and a complete set of instructions is provided. Author

N80-14048*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
A THREE DIMENSIONAL VORTEX WAKE MODEL FOR MISSILES AT HIGH ANGLES ON ATTACK Final Report
J. Steven Sheffield and F. D. Deffenbaugh Jan. 1980 59 p refs
(Contract NAS2-9579)
(NASA-CR-3208; TRW-30584-6003-RU-00) Avail: NTIS HC A04/MF A01 CSCL 01A

A three dimensional model for the steady flow past missile and aircraft nose shaped bodies is presented based on augmenting a potential solution with a wake composed of vortex filaments. The vortex positions are determined by the requirement that they, in some sense, align with the flow. The aerodynamic loads on the body are compared with experimental values and used to evaluate the model. The vortex positions compare well with flow visualization results for slender bodies at high angles of attack. The approximations in the wake near the body cause peaks in the force distributions more severe than in the measured values. For given vortex strengths and body attachment points multiple steady vortex positions were not found. Author

N80-14049*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF TIP PLANFORM ON BLADE LOADING CHARACTERISTICS FOR A TWO-BLADED ROTOR IN HOVER
John D. Ballard, Kenneth L. Orloff, and Alan B. Luebs (Gates Lear Corp., Wichita, Kan.) Nov. 1979 89 p refs
(NASA-TM-78615; A-7939) Avail: NTIS HC A05/MF A01 CSCL 01A

A laser velocimeter was used to study the flow surrounding a 2.13 m diam, two-bladed, teetering model-scale helicopter rotor operating in the hover condition. The rotor system employed interchangeable blade tips over the outer 25% radius. A conventional rectangular planform and an experimental ogee tip shape were studied. The radial distribution of the blade circulation was obtained by measuring the velocity tangent to a closed rectangular contour around the airfoil section at a number of radial locations. A relationship between local circulation and bound vorticity was invoked to obtain the radial variations in the sectional lifting properties of the blade. The tip vortex-induced velocity was also measured immediately behind the generating blade and immediately before the encounter with the following blade. The mutual influence between blade loading, shed vorticity, and the structure of the encountered vortex are quantified by the results presented and are discussed comparatively for the rectangular and ogee planforms. The experimental loading for the rectangular tip is also compared with predictions of existing rotor analysis. Author

N80-14050*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LASER ANEMOMETER MEASUREMENTS IN A TRANSONIC AXIAL FLOW COMPRESSOR ROTOR
Anthony J. Strazisar and J. Anthony Powell 1979 17 p refs Presented at 25th Ann. Intern. Gas Turbine Conf. and 22d Ann. Fluids Engr. Conf., New Orleans, 9-13 Mar. 1970; sponsored by ASME
(NASA-TM-79323; E-279) Avail: NTIS HC A02/MF A01 CSCL 01A

A laser anemometer system employing an efficient data acquisition technique was used to make measurements upstream, within, and downstream of the compressor rotor. A fluorescent dye technique allowed measurements within endwall boundary layers. Adjustable laser beam orientation minimized shadowed regions and enabled radial velocity measurements outside of the blade row. The flow phenomena investigated include flow variations from passage to passage, the rotor shock system, three-dimensional flows in the blade wake, and the development of the outer endwall boundary layer. Laser anemometer measurements are compared to a numerical solution of the streamfunction equations and to measurements made with conventional instrumentation. Author

N80-14051*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODIFICATION OF AXIAL COMPRESSOR STREAMLINE PROGRAM FOR ANALYSIS OF ENGINE TEST DATA
Jeffrey G. Williams Nov. 1979 49 p refs
(NASA-TM-79312; E-268) Avail: NTIS HC A03/MF A01 CSCL 01A

An existing axial compressor streamline analysis computer program to allow input of measured radial pressure and temperature profiles obtained from engine or cascade data is described. The proposed modifications increase the input flexibility

and are accomplished without changing the computer program's input format. A.R.H.

N80-14052*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
THE QUASI-VORTEX-LATTICE METHOD FOR WINGS WITH EDGE VORTEX SEPARATION Final Report
Jenn-Louh Pao and Edward Lan Jan. 1980 25 p refs
(Grant NsG-1537)
(NASA-CR-162530; CRINC-FRL-385-1) Avail: NTIS HC A02/MF A01 CSCL 01A

The aerodynamic characteristics of wings with leading-edge vortex separation were predicted using a method based on a flow model with free vortex elements which are allowed to merge into a concentrated core. The calculated pressure distribution is more accurate than that predicted by methods with discrete vortex filaments alone. In addition, the computer time is reduced approximately by half. A.R.H.

N80-14053*# Old Dominion Univ. Research Foundation, Norfolk, Va.
THEORETICAL STUDY OF AERODYNAMIC CHARACTERISTICS OF WINGS HAVING VORTEX FLOW Report, 1 Feb. - 31 Aug. 1978
C. Subba Reddy Nov. 1979 63 p refs
(Contract NAS1-14193)
(NASA-CR-159184) Avail: NTIS HC A04/MF A01 CSCL 01A

The aerodynamic characteristics of slender wings having separation induced vortex flows are investigated by employing three different computer codes--free vortex sheet, quasi vortex lattice, and suction analogy methods. Their capabilities and limitations are examined, and modifications are discussed. Flat wings of different configurations: arrow, delta, and diamond shapes, as well as cambered delta wings, are studied. The effect of notch ratio on the load distributions and the longitudinal characteristics of a family of arrow and diamond wings is explored. The sectional lift coefficients and the accumulated span loadings are determined for an arrow wing and are seen to be unusual in comparison with the attached flow results. The theoretically predicted results are compared with the existing experimental values. A.W.H.

N80-14054*# Old Dominion Univ. Research Foundation, Norfolk, Va.
OPTIMIZED AERODYNAMIC DESIGN PROCESS FOR SUBSONIC TRANSPORT WING FITTED WITH WINGLETS
John M. Kuhlman Dec. 1979 184 p refs
(Contract NsG-1357)
(NASA-CR-159180) Avail: NTIS HC A09/MF A01 CSCL 01A

The aerodynamic design of a wind-tunnel model of a wing representative of that of a subsonic jet transport aircraft, fitted with winglets, was performed using two recently developed optimal wing-design computer programs. Both potential flow codes use a vortex lattice representation of the near-field of the aerodynamic surfaces for determination of the required mean camber surfaces for minimum induced drag, and both codes use far-field induced drag minimization procedures to obtain the required spanloads. One code uses a discrete vortex wake model for this far-field drag computation, while the second uses a 2-D advanced panel wake model. Wing camber shapes for the two codes are very similar, but the resulting winglet camber shapes differ widely. Design techniques and considerations for these two wind-tunnel models are detailed, including a description of the necessary modifications of the design geometry to format it for use by a numerically controlled machine for the actual model construction. Author

N80-14055*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A COMPUTERIZED METHOD FOR CALCULATING FLUTTER CHARACTERISTICS OF A SYSTEM CHARACTERIZED BY TWO DEGREES OF FREEDOM
Winifred A. Stahlaker and William F. Hunter Nov. 1979 52 p ref
(NASA-TM-80153) Avail: NTIS HC A03/MF A01 CSCL 01A

A formulation is given for calculating flutter frequency and flutter speed for a problem with two degrees of freedom. Two different solutions for evaluating the flutter determinant are presented and the results for each method are compared. A program flow diagram, partial program listing, and a sample problem with input and output for the two different methods are included. Although the method was developed for computing flutter characteristics of a pylon installed in the NASA Langley VSTOL tunnel, it is sufficiently general to solve any flutter system that can be characterized by two degrees of freedom. A.R.H.

N80-14056*# Boeing Commercial Airplane Co., Seattle, Wash.
AN INVESTIGATION OF SEVERAL FACTORS INVOLVED IN A FINITE DIFFERENCE PROCEDURE FOR ANALYZING THE TRANSONIC FLOW ABOUT HARMONICALLY OSCILLATING AIRFOILS AND WINGS
F. E. Ehlers, J. D. Sebastian, and W. H. Weatherill May 1979 89 p refs
(Contract NAS1-15128)
(NASA-CR-159143; D6-48852) Avail: NTIS HC A05/MF A01 CSCL 01A

Analytical and empirical studies of a finite difference method for the solution of the transonic flow about harmonically oscillating wings and airfoils are presented. The procedure is based on separating the velocity potential into steady and unsteady parts and linearizing the resulting unsteady equations for small disturbances. Since sinusoidal motion is assumed, the unsteady equation is independent of time. Three finite difference investigations are discussed including a new operator for mesh points with supersonic flow, the effects on relaxation solution convergence of adding a viscosity term to the original differential equation, and an alternate and relatively simple downstream boundary condition. A method is developed which uses a finite difference procedure over a limited inner region and an approximate analytical procedure for the remaining outer region. Two investigations concerned with three-dimensional flow are presented. The first is the development of an oblique coordinate system for swept and tapered wings. The second derives the additional terms required to make row relaxation solutions converge when mixed flow is present. A finite span flutter analysis procedure is described using the two-dimensional unsteady transonic program with a full three-dimensional steady velocity potential. Author

N80-14057# Air Force Geophysics Lab., Hanscom AFB, Mass.
PROCEEDINGS OF THE 10TH AFGL SCIENTIFIC BALLOON SYMPOSIUM
Catherine L. Rice 1 Mar. 1979 519 p refs Proc. held at Portsmouth, N.H., 21-23 Aug. 1978
(AD-A074469; AFGL-TR-79-0053; AFGL-SR-217) Avail: NTIS HC A22/MF A01 CSCL 01/3

This publication contains the Keynote Address and twenty-nine papers presented at the Tenth AFGL Scientific Balloon Symposium, 21-23 August 1978, at Portsmouth, N. H. The five sessions were entitled: Balloon Technology - Progress and Problems; Manned Flights; Stratospheric Measurements; Airship Design Concepts; and Methods and Models. GRA

N80-14058# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
HIGH ANGLE OF ATTACK CHARACTERISTICS OF DIFFERENT FIGHTER CONFIGURATIONS
Helmut John and Kraus Werner 7 Sep. 1978 40 p refs Presented at Symp. on High Angle of Attack Aerodyn., Sandefjord, Norway, 4-6 Oct. 1978
(MBB-UFE-1443(O)) Avail: NTIS HC A03/MF A01

Basic aerodynamic characteristics of different fighter configurations at separated flow beyond maximum lift where the resultant derivatives are completely different from those associated with attached flow are reviewed. The change in trim conditions is primarily dependant on wing planform and overall aircraft configuration. Results are shown for the aerodynamic development of aircraft configurations which meet these requirements and, at the same time, minimize the resulting drag penalties in the conventional angle of attack regime. Furthermore, problem areas and deficiencies must be identified to allow the definition of concepts for stabilizing such configurations artificially by aid of a flight control system. It is shown that an auxiliary momentum generating system is necessary for controlling the aircraft at

flight conditions where aerodynamic control power is not sufficient. Author (ESA)

N80-14059# Poitiers Univ. (France).
SEPARATED TURBULENT FLOW BEHIND A STALLED AIRFOIL [CHAMP D'ECOULEMENT DECOLLE TURBULENT DERRIERE UN PROFIL DECROCHE]
J. Tensi Paris Assoc. Aeron. Astronautique de France 1979 55 p refs In FRENCH Presented at 15th Colloq. d'Aerodyn. Appl., Marseille, 7-9 Nov. 1978
(AAAF-NT-79-12; ISBN-2-7170-0539-0) Avail: NTIS HC A04/MF A01; CEDOCAR, Paris FF 29 (France and EEC) FF 33 (others)

The average and oscillating velocities in separated flow areas capable of generating buffeting in stable profiles were studied in a wind tunnel. The tests were made in an incompressible flow regime on NACA 65.012 and 'Fauville' profiles, one symmetric and the other strongly cambered (for bidimensional flow), and also on a delta wing profile for three dimensional flow. The velocity - distribution charts obtained at an angle of attack of 20 deg are included. Author (ESA)

N80-14060# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).
STUDY OF THE FORMATION OF LAMINAR FLOW SEPARATION INDUCED BY THE DEFLECTION OF A CONTROL SURFACE [ETUDE DE LA FORMATION D'UN DECOLLEMENT LAMINAIRE INDUIT PAR LE BRAQUAGE D'UNE GOUVERNE]
Marie-Francoise Scibilia and Daniel Durox Feb. 1979 16 p refs In FRENCH
(Rept-79-2; Publ-598) Avail: NTIS HC A02/MF A01

The laminar flow separation induced by aileron deflection in a rarefied gas medium characterized by a Mach number of 8, Reynolds number of 2200/cm, and simulated flight altitude of 60 km was studied measuring heat transfer and comparing results with previous work under similar conditions. A fixed nul incidence was adopted. The model was nickel plated; the metallic aileron was provided with a electromagnetic deflection system and the wind tunnel tests were done at 50 K temperature and 70 micro torr pressure. The experimental results of heat flow and visualization are in good agreement with the Cheng and Kemp theories. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N80-14061# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Technical and Resources Management Div.
AERONAUTICAL SYSTEMS TECHNOLOGY NEEDS: ESCAPE, RESCUE AND SURVIVAL Annual report for calendar year 1979
Donald C. Kittinger Aug. 1979 30 p refs Supersedes ASD-TR-78-21
(AD-A074906; ASD-TR-79-5038; ASD-TR-78-21) Avail: NTIS HC A03/MF A01 CSCL 06/7

This report is a part of a compilation of formalized Technology Needs TN covering Equipment Subsystems as identified in the Aeronautical Systems Division. They are based on development/operational experience, systems studies and new concepts - all related to future system applications. Their presentation is to serve a threefold purpose, i.e., 1 guidance for technology program, 2 proven development potential, and 3 engineering data/requirements essential for technology use in systems. The identified needs delineate progress desired in performance, control, design flexibility, safety and cost. GRA

N80-14062# BioTechnology, Inc., Falls Church, Va.
NAVY COMBAT SEARCH AND RESCUE Final Report
Martin G. Every Sep. 1979 57 p refs
(Contract N00014-77-C-0253)
(AD-A074593) Avail: NTIS HC A04/MF A01 CSCL 06/7

Navy Combat Search and Rescue (SAR) information was collected from aircrewman downed in Southeast Asia, Navy and Air Force records, and Missing and Killed in Action (MIA/KIA) files. This data was analyzed to evaluate the extent and effectiveness of Navy combat SAR, and to determine if indeed it functions as one continuous phase of the aircraft escape-to-rescue process. SAR mission success/loss rates are presented along with a discussion of the key factors which were causal in determining the success or failure of these missions. This report discusses possible alternatives to conventional combat SAR, such as mid-air recovery, and shows how the combat data collected can be used to model some of these alternatives. GRA

N80-14063# Air Force Engineering and Services Center, Tyndall AFB, Fla. Directorate of Environmental Planning.
AN EVALUATION OF THE BIRD/AIRCRAFT STRIKE HAZARD AT BARKSDALE AIR FORCE BASE, LOUISIANA (SAC) Final Report
Jeffrey J. Short and James S. Kent Feb. 1979 68 p
(AD-A074390; AFESC-TM-2-79) Avail: NTIS HC A04/MF A01 CSCL 06/6

Barksdale Air Force Base was surveyed from 31 January to 9 February 1979 by the Air Force Engineering and Service Center's Bird/Aircraft Strike Hazard Team. During this period, operational and environmental factors which combine to create bird strike hazards were observed. Specific recommendations based on observations are provided to reduce the bird strike hazard. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N80-14064# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AIR TRAFFIC DENSITY AND DISTRIBUTION MEASUREMENTS
W. H. Harman 3 May 1979 63 p refs
(Contract DOT-FA77WAI-817; FAA Proj. 052-241-04)
(AD-A073229; FAA-RD-78-45; ATC-80) Avail: NTIS HC A04/MF A01 CSCL 01/2

The measurements made in 1976 to determine the peak air traffic density, the spatial distribution, and the variation with time for transponder equipped aircraft in the Los Angeles area and at several locations on the east coast are presented. The use of these measurements for the design and evaluation of the discrete address beacon system and the air traffic control radar beacon system is discussed. A.W.H.

N80-14065# Fondazione Ugo Bordoni, Rome (Italy).
ON RADAR IN AIR TRAFFIC CONTROL Final Report [IL RADAR NEL CONTROLLO DEL TRAFFICO AEREO]
Jul. 1979 485 p refs In ITALIAN; ENGLISH summary Proc. of lectures at CNR Aiuti alla Navagazione e Controllo del Traffic Aereo, Rome 3-5 Jul. 1979
(FUB-11-1979) Avail: NTIS HC A21/MF A01

A collection of 41 papers is presented, grouped in the following main chapters: planning and operation of radar networks, automation in air traffic control, processing and visualization of radar data, developments in primary radar, radar antennas and wave propagation, and developments in secondary radar. For individual titles, see N80-14066 through N80-14105.

N80-14066# Aeronautica Militare Italiana, Rome.
PROBLEMS RELATED TO THE DESIGN AND CONSTRUCTION OF A RADAR NETWORK Final Report [PROBLEMATICHE NELL'IMPOSTAZIONE E REALIZZAZIONE DELLA RETE RADAR]
A. Tangorra *In* Fond. Ugo Bordoni On Radar in Air Traffic

Control Jul. 1979 p 14-23 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The radar planning for Italy, issued in 1976 by the Italian Air Force, is discussed. The more interesting features connected with the construction of a radar center are examined with special regard to operational availability, automation, and costs. Some of the problems of the execution phase are especially analyzed, including siting criteria, social and administrative problems, and coordination between various organizations involved.
Author (ESA)

N80-14067# Selenia S.p.A., Rome (Italy). Div. Radar e Sistemi Civili.
METHODOLOGY FOR THE EVALUATION OF A RADAR SITE Final Report [METODOLOGIA DI VALUTAZIONE DI UN SITO RADAR]
B. Labozzetta *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 25-30 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The technical and economical factors involved in a radar site selection are described. The operation requirements are expressed as covered volume, and data flow rate. The macrositing and micrositing criteria are discussed jointly with the analysis of the factors that determine the radar performance for reducting the candidate sites. The fixed echoes, the angles, other signal interference, the overall visibility, and the impact on environment are examined as relevant to the procedure. The analysis is limited to implementation cost only. Running costs are deemed similarly structured.
Author (ESA)

N80-14068# Selenia S.p.A., Rome (Italy).
PERFORMANCE EVALUATION METHODS OF A SECONDARY RADAR NETWORK Final Report [METODI DI VALUTAZIONE DELLE PRESTAZIONI DI UNA RETE DI RADAR SECONDARI]
G. Fraschetti and U. Merlo (Fond. Ugo Bordoni, Rome) *In* Fond. Ugo Bordoni On radar in Air Traffic Control Jul. 1979 p 31-41 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Interference in secondary surveillance radar is evaluated. Analytical and simulation methods for the evaluation of the effects of sensor network and transponder spatial density on detection probability, azimuth measurement, and code identification are proposed. Some results obtained under a typical Italian air traffic condition, taking into account propagative effects, are reported. Extention of the proposed methods to the case of monopulse radar is also outlined.
Author (ESA)

N80-14069# Compagnia Italiana Servizi Tecnici, Rome.
ORGANIZATION OF AN INTEGRATED GLOBAL MAINTENANCE SERVICE Final Report [ORGANIZZAZIONE DI UN SERVIZIO INTEGRATO DI MANUTENZIONE GLOBALE]
R. Grazi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 43-54 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The development of integrated maintenance techniques is examined to better satisfy the requirements of a future comprehensive radar system. The present situation is described showing that the present organization for air traffic control is adequate for present and immediate future requirements. For the planned expansion of the radar network an automated, and centralized radar control is proposed. The details of the technical control centers and the organization of the new system are discussed.
Author (ESA)

N80-14070# Consiglio Nazionale delle Ricerche, Rome (Italy). Centro di Studi dei Sistemi di Controllo e Calcolo Automatici.
AUTOMATION OF FLIGHT ON-LINE STRATEGIC CONTROL: THE CASE OF SPEED CONTROL ON PRE-ESTABLISHED ROUTES Final Report [L'AUTOMAZIONE DEL CONTROLLO STRATEGICO ON-LINE DELVOLI: IL CASO DEL CONTROLLO DI VELOCITA' SU ROTTE PRESTABILITE]
L. Bianco, M. Cini, and L. Grippo *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 58-68 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The problem of on-line strategic control is examined with reference to speed control on preassigned routes, and under the hypothesis that planning is performed for each flight on the basis of the first in, first out discipline. The control problem is formulated as a constrained mathematical programming problem. A real time working algorithm is proposed.
Author (ESA)

N80-14071# Consiglio Nazionale delle Ricerche, Rome (Italy). Centro di Studi dei Sistemi di Controllo e Calcolo Automatici.
RADAR DATA UTILIZATION IN AUTOMATING THE SEQUENCING OF AIRCRAFTS IN TERMINAL AREAS Final Report [L'UTILIZZAZIONE DEI DATA RADAR NELL'AUTOMAZIONE DEL SEQUENZIAMENTO DEGLI AEREI IN AREA TERMINALE]
L. Bianco, S. Ricciardelli, G. Rinaldi, and A. Sassano *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 69-79 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A mathematical model for aircraft sequencing is presented, and an optimizing algorithm is proposed including some tests results. The algorithm finds the optimum by progressively restricting the set of admisable sequences, and evaluating each time preset value function related to the given objectives. As a programming language FORTRAN 5 was used on a Univac 1110/22 computer for the test method. The results show satisfactory operation of the algorithm in the tested interval, especially in relation to the problem of real time operation.
Author (ESA)

N80-14072# Consiglio Nazionale delle Ricerche, Rome (Italy). Ist. di Automatica.
TACTICAL ANALYSIS OF CONFLICTS IN AN AIR TRAFFIC CONTROL SYSTEM: DESIGN AND IMPLEMENTATION OF A PROVISIONAL MODEL Final Report [ANALISI DEI CONFLITTI IN UN SISTEMA ATC SU BASE TATTICA: COSTRUZIONE DI UN MODELLO DI PREVISIONE E SUA IMPLEMENTAZIONE]
P. Bertolazzi and M. Lucertini *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 81-89 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

An algorithm for the conflict alert automated function in an air traffic control system is described. The influence of radar errors is analyzed and the numerical results on computing time and on reliability are presented. The program conflict analysis was tested with artificial data and with experimental data from Rome and Genoa. The results show that no false alarms occured, and that the average CPU time (Univac 1100/22) for a constant load of 30 artificial trajectories is in the order of one second.
Author (ESA)

N80-14073# Consiglio Nazionale delle Ricerche, Pisa (Italy). Ist. di Elaborazione dell'Informazione.
SIMULATION OF A SURVEILLANCE AND CONTROL SYSTEM OF SURFACE TRAFFIC IN AN AIRPORT Final Report [SIMULAZIONE DI UN SISTEMA DI SORVEGLIANZA E CONTROLLO DEL TRAFFICO SUPERFICIALE DI UN AEROPORTO]
M. Mercatanti, G. Bastianini, U. Ferri, and M. Saliba *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 91-101 refs In ITALIAN (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The main requirements of a program for the simulation of a surveillance and control system are examined for the case of a system using primary radar to control aircraft and service vehicles. Several complexity levels of the system are proposed corresponding to program modules. A minimum configuration of the program includes airfield definition data, simulation of radar signals from aircraft on the airport surface, recognition of the aircraft based upon radar signals and identification data given to the system at the landing stage, and representation on a video screen of the airport, and the aircraft identified by corresponding labels.
Author (ESA)

N80-14074# Selenia S.p.A., Rome (Italy).
TRACKING ALGORITHMS FOR MONO AND MULTIRADAR Final Report [ALGORITMI DI TRACKING MONO E MULTI RADAR]
S. Pardini, N. Del (Florence Univ.), and G. Zappa (Florence Univ.) *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 111-122 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Some algorithms for target tracking by means of track-while-scan techniques are analyzed. Some models of target paths, matched to typical air traffic control trajectories, are shown. In the case of multiradar systems, additional causes of measurement error are discussed, and some ways to integrate information coming from different radars are compared. Author (ESA)

N80-14075# Selenia S.p.A., Rome (Italy). Div. Radar e Sistemi Civili.
A DISTRIBUTED PROCESSING SYSTEM FOR RADAR DATA PRESENTATION Final Report [SISTEMA DI PROCESSING E PRESENTAZIONE DATI RADAR A STRUTTURA DISTRIBUITA]
G. Barale *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 123-134 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The main processing functions used for radar data handling in air traffic control automated systems are described using the example of a distributed processing system based on a minicomputer architecture in which all the system functions are performed. Another example consisting of recent studies on a multiprocessor systems for air traffic control is also given. Author (ESA)

N80-14076# Selenia S.p.A., Rome (Italy). Div. Radar e Sistemi Civili.
FILTERING OF SYNTHETIC RADAR DATA Final Report [FILTRAGGIO DELL'INFORMAZIONE RADAR SINTETICA]
N. Iafolla and R. Petrioli (Fond. Ugo Bordoni) *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 135-142 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Further processing of radar data coming out of the primary and secondary extractors is studied to reduce mistakes and noise level by using space and time correlations wider than those currently adopted in radar sensors and extractors. The most frequent anomalies of primary and secondary radar data are first reviewed. A detailed description of synthetic radar data filtering is presented, and then compared to a multiradar air traffic control system with distributed architecture. It includes the initial plot processing, the plot combination, the signature-plot association, the logic of signature characterization, and the multiradar combination and special processing. The aim is to simulate human operator data processing leading to a possibility of further automation of radar surveillance systems. Author (ESA)

N80-14077# Selenia S.p.A., Rome (Italy).
VISUAL DISPLAYS FOR AIR TRAFFIC CONTROL DATA Final Report [SISTEMI DI VISUALIZZAZIONE DEI DATI ATC]
Franco Odoardi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 143-153 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A review of visual displays for air traffic control data is presented. Topics discussed include: raw radar data and computer generated data mixed systems, maximum displayable load and readability of synthetic data in a very bright environment, dedicated displays and requirements, and color display and digital scan converter developments. Author (ESA)

N80-14078# Florence Univ. (Italy). Ist. di Elettronica.
EXPERIMENTAL CAMPAIGN FOR THE ANALYSIS OF DYNAMIC CLUTTER: THE DATA ACQUISITION SYSTEM Final Report [CAMPAGNA SPERIMENTALE PER L'ANALISI DEL CLUTTER DINAMICO: IL SISTEMA DI ACQUISIZIONE DATI]
A. Bolognin, G. DeFina (Segnalamento Marittimo ed Aereo S.P.A.), F. Fantacci, and F. Pirri *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 159-168 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Dynamic clutter still impairs radar system performance. To improve the knowledge of some characteristics of this phenomena, a measurement activity devoted to the particular Italian environment was planned. In order to collect clutter echo recordings without special recording instruments, an interface machine was provided, which selects and samples clutter signals. The recordings are afterward converted into digital data and then processed. The interface operation and its use in the data acquisition system are described. Author (ESA)

N80-14079# Florence Univ. (Italy). Ist. di Elettronica.
EXPERIMENTAL CAMPAIGN FOR THE ANALYSIS OF DYNAMIC CLUTTER: PROCESSING OF RECORDED DATA Final Report [CAMPAGNA SPERIMENTALE PER L'ANALISI DEL CLUTTER DINAMICO: ELABORAZIONE DEI DATI REGESTRATI]
A. Bolognin, E. Giaccari (Selenia S.P.A.), D. Giuli, G. Pelosi, and F. Pirri *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 169-178 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A method of processing the data collected from recordings of clutter echo signals is described. Digital data are first ordered and selected by means of special programs. Then an autoregressive method is used to obtain an estimation of clutter power spectrum from the sampled signal; the use of this method is briefly explained and justified for this purpose. Estimations of power spectra are made for both range and azimuth sequences, in order to determine the characteristics of dynamic clutter in the Italian environment. Author (ESA)

N80-14080# Selenia S.p.A., Rome (Italy).
DYNAMIC CLUTTER REDUCTION TECHNIQUES WITH MOVING TARGET INDICATED ADAPTIVE FILTERS Final Report [TECHNICHE PER LA RIDUZIONE DEL CLUTTER DINAMICO CON FILTRI MTI ADATTIVI]
G. Apolloni, E. DalleMese (Pisa Univ., Italy), G. Giaccari, and G. Picchi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 179-187 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The state-of-the-art in adaptive moving target indicator (MTI) filtering is reviewed. Open loop adaptive MTI filters are examined with emphasis on two system block diagrams. Discussion of closed loop adaptive filters includes the description of a system in which adaptiveness is obtained changing the frequency and phase of a oscillator rather than the MTI filter coefficient. An analysis of the relative advantages and disadvantages of open and closed loop filters is also presented. Author (ESA)

N80-14081# Florence Univ. (Italy). Ist. di Elettronica.
PRELIMINARY STUDY ON THE UTILIZATION OF ADAPTIVE RADAR RECEIVERS WITH DIVERSITY POLARIZATION Final Report [STUDIO PRELIMINAIRE SULL'IMPIEGO DI RICHEVITORI RADAR ADATTIVI IN DIVERSITA' DI POLARIZZAZIONE]
G. Biffi Gentili and D. Giuli *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 189-207 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The advantages of using diversity polarization radar antennas is examined. It is shown that the average power of a partially polarized echo due to distributed targets can be reduced by determining the optimum signal linear combination of the two orthogonal polarization channels. The theoretical performance of an adaptive radar receiver is analyzed for the case of rain clutter. Author (ESA)

N80-14082# Pisa Univ. (Italy). Ist. di Elettronica e Telecomunicazioni.
THE RANGE REDUCTION OF PRIMARY RADAR DUE TO RAIN Final Report [SULLA RIDUZIONE DI PORTATA DEL

RADAR PRIMARIO SOTTO PIOGGIA]
U. Tiberio *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 209-218 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The calculation of the thermal and diffusion absorption surface of small raindrops, in the Raleigh band, is used to deduce the dissipation characteristics of the entire transmission media including the attenuation coefficient, the rain front reflection coefficient, and the differential phase shift. It is shown that the range reduction without considering clutter effects can be estimated from the given formulas under normal rain conditions. Possible improvements are discussed including alternative solutions for the reduction of the clutter influence. Author (ESA)

N80-14083# Selenia S.p.A., Rome (Italy).
PERFORMANCE EVALUATION OF A COHERENT CHAIN IN TRANSMISSION Final Report
Ennio Giaccari *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979- p 219-227 (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Some significant parameters of coherent chain in transmission are determined, considering two aspects of transmitter design, which are the transmitter stability and the waveform selection. Instead of using conventional formulas the true system behavior is found by employing a simulation technique. The results show that the minimization of the bandwidth occupation requires the control of the transmitted pulse shape, and that high valves of improvement factors are only obtained using modulators with very low pulse amplitude variation and pulse time jitter.
Author (ESA)

N80-14084# Palermo Univ. (Italy). Ist. di Elettrotecnica ed Elettronica.
THE INFLUENCE OF TRANSMITTER STABILITY ON PRIMARY RADAR PERFORMANCE Final Report [INFLUENZA DELL'INSTABILITA' DEL TRASMETTITORE SULLE PRESTAZIONI DI UN RADAR PRIMARIO]
G. Capponi, B. DiMaio, M. Sannino, and L. Zanfortin *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 229-238 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The features of the power device that are responsible for amplitude, phase and frequency instability of the radio frequency pulses are discussed. The updated values of the parameters expressing such performance suitable to those corresponding to modulator characteristics are then used to find the limiting figures of the moving target indicator. On the basis of these quantitative results, some transmitter arrangements are changed from the classical single-stage versions to advanced ones. The related main technical features are finally compared. Author (ESA)

N80-14085# Centro per la Ricerca Elettronica in Sicilia, Monreale (Italy).
PHASE-LOCKING IN POWER OSCILLATORS Final Report [CONSIDERAZIONI SULL'AGGANCIO DI FASE DI OSCILLATORI DI POTENZA]
E. Calandra and A. Sommariva *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 239-248 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Equations describing the static and dynamic behavior of a phase locked microwave power oscillator are examined to analyze the locking gain and fast transient performance required for moving target indicator radar applications. The influence of the design parameters on typcial radar characteristics is graphically analyzed by means of practical examples. It is shown that the performance requirements be met only through direct control of the oscillation buildup. Author (ESA)

N80-14086# Selenia S.p.A., Rome (Italy).
IMPLEMENTATION OF AIR TRAFFIC CONTROL RADAR RECEIVERS WITH FAST FOURIER TRANSFORM PROCESSORS Final Report [INTEGRAZIONE COERENTE CON FFT NEI RICEVITORI RADAR PER ATC]
In Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 249-260 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The main radar problems concerning present and future air traffic control (ATC) radars are briefly reviewed with emphasis on moving clutter. The equivalence between a fast Fourier transform (FFT) processor and a Doppler filter bank is shown. A video FFT receiver for an ATC radar is described. Results on the performance of the FFT receiver are compared to that of the moving window receiver. It is concluded that in a clutter free environment the FFT receiver has greater losses, while in moving clutter it shows relevant advantages. Author (ESA)

N80-14087# Segnalamento Marittimo ed Aereo S.p.A., Florence (Italy).
DEVELOPMENT TRENDS OF AIRPORT SURFACE TRAFFIC CONTROL RADAR Final Report [PREVEDIBILI SVILUPPI DEL RADAR PER IL CONTROLLO DEL TRAFFICO SULLA SUPERFICIE AEROPORTUALE]
S. Betini, M. Piattelli, and G. Defina *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 261-267 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The systems in use, and development trends are examined, pointing out that surface traffic growth in airports makes economically attractive a generalized use of dedicated radar sensors. It is shown that trends at present are oriented towards the I and J band frequencies which are more reliable in rainfall, while some time ago the millimeter waves were studied because of their higher angular resolution. Some specific techniques, together with new electronic components suggest that it is possible to develop a fully operative, cost-effective device. Author (ESA)

N80-14088# Consiglio Nazionale delle Ricerche, Florence (Italy). Ist. di Ricerca sulle Onde Elettromagnetiche.
AN AIR TRAFFIC CHANNEL SIMULATION BY MEANS OF RAY-TRACING TECHNIQUES Final Report [LA SIMULAZIONE DEL CANALE AERONAUTICO PER MEZZO DI TECNICHE DI RAY-TRACING]
P. Beni, F. Bertini, and P. F. Pellegrini *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 277-285 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A three-dimensional ray tracing procedure is described which was used for propagation studies on the secondary surveillance radar (SSR) RF aeronautical channels. This procedure is based on the numerical integration of the ray canonical equations originating from the geometric optics. Phenomena such as multipath (due to the specular reflections) and shadowing, can be investigated by means of this method of numerical computer simulation. The computed ray paths of the RF energy, utilizing an environment model (whichincludes a tridimensional true model of the ground surface and of the atmosphere, constructed from experimental data) can be compared with propagation data (measured) obtained in real situations. The theoretical formulation of ray tracing is summarized. A description is given of the procedure followed for modelling the ground surface, and an example of ray tracing is presented Author (ESA)

N80-14089# Consiglio Nazionale delle Ricerche, Rome (Italy). Centro di Studio per le Telecommunicazioni Spaziali.
COMPARISON BETWEEN THE FIRST PLUVIOMETRIC DATA OBTAINED WITH AN S-BAND RADAR AND ATTENUATION DATA AT 11.6 GHz OBTAINED SIMULTANEOUSLY BY MEANS OF THE SIRIO SATELLITE Final Report [CONFRONTO FRA I PRIMI DATI PLUVIOMETRICI OTTENUTI CON UN RADAR IN BANDA S E DATI DI ATTENUAZIONE A 11.6 GHz OTTENUTI SIMULTANEAMENTE PER MEZZO DEL SATELLITE SIRIO]
C. Capsoni, M. Mauri, A. Paraboni (Politecnico di Milano), and M. Politi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 285-295 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Rain intensity data from meteorological radar are compared

with attenuation data at 11.6 GHz directly obtained by the SIRIO satellite in order to implement optimum procedures so as to transform reflectivity data into attenuation data. As an example, it is shown how simultaneous radar and SIRIO data can be processed toghether and optimum matching procedures can be applied. Once the radar is well calibrated, it proves a very useful tool in investigating extensively the rain structures causing trouble in radio channels at centimetric and millimetric wavelengths. An example of this is also presented. Author (ESA)

N80-14090# Segnalamento Marittimo ed Aereo S.p.A., Florence (Italy).

SYNTHESIS OF LINEAR ARRAY RADIATION PATTERNS Final Report [SINTESI DI DIAGRAMMI DI IRRADIAZIONE MEDIANTE ARRAY LINEARI]

P. Lombardi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 297-306 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

A computerized iterative sampling method for the synthesis of antenna radiation patterns is described. The method is used for the determination of the current distribution for the excitation of the arrays radiant elements to produce a given coefficient. To increase the speed of the iterative procedure the fast fourier transform is used. The most significative results, and the development trends are presented. Author (ESA)

N80-14091# Selenia S.p.A., Rome (Italy). Direz. Tecnica.

PRELIMINARY ANALYSIS AND SELECTION CRITERIA FOR AN ANTENNA FOR A SECONDARY RADAR SYSTEM Final Report [ANALISI PRELIMINARE E CRITERI DI SCELTA DI UN'ANTENNA PER UN SISTEMA PER RADAR SECONDARIO (DABS)]

A. Saitto, M. DiFausto, and B. Palumbo *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 307-317 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

A feasibility study was performed on the characteristics of an antenna for a secondary radar system (discrete address beacon system). A tradeoff study is presented of possible configurations fulfilling the requirements of the radiation pattern slope at the horizon, the sidelobe level, the elevation coverage and the monopulse operation, under the constraint of mechanical compatibility with the existing structures of the ATC radar antennas and rotation devices. After an analysis of the aperture distributions and a presentation of calculated performance of the antenna, a parabolic cylinder reflector antenna, fed by a linear array, and a planar array are described as candidate solutions. Author (ESA)

N80-14092# Consiglio Nazionale delle Ricerche, Florence (Italy). Ist. di Ricerca sulle Onde Elettromagnetiche.

L-BAND MEASUREMENTS IN THE AIR TRAFFIC CHANNEL TO CHARACTERIZE SECONDARY RADAR SYSTEMS Final Report [MISURE SUL CANALE AERONAUTICO IN BANDA L AI FINI DELLA CARATERRIZZAZIONE DI SISTEMI DI RADAR SECONDARI]

P. F. Pellegrini, R. Cappadona, R. Ruisi, M. Trambusti, and V. Venturi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 323-332 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

The equipment used to characterize secondary radar propagation channels is described. The equipment includes a transmitting system, a receiving system, and a data processing system. Part of the apparatus was designed to be airborne, and part to be used on the ground independently, or with a radar system. Author (ESA)

N80-14093# Rome Univ. (Italy). Ist. di Comunicazioni Elettriche.

MONOPULSE RECEIVER PERFORMANCE IN SSR AND DABS SYSTEMS Final Report [PRESTAZIONI DI RICEVITORI MONOPULSE IN SISTEMI SSR E DABS]

S. Cacopardi, G. Diblasio, G. Jacovitti, and P. Mandarini *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 333-346 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

A comparison analysis of various azimuth angle measurement methods employing monopulse techniques is presented. The different error causes affecting measurement precision were examined, and their effects on the monopulse performance are summarized for each method and related to the system parameters. Then, for each monopulse receiver scheme, a quality index was defined, evaluated, and utilized, applying some well known decision criteria for the optimum parameter determination. Finally, for comparison purposes, the behavior of the quality index in function of the signal-to-noise ratio and the off-boresight angle is given for each monopulse receiver scheme. Author (ESA)

N80-14094# Florence Univ. (Italy). Ist. di Elettronica.

INTERFERENCE EFFECTS IN MONOPULSE ESTIMATION IN SECONDARY SURVEILLANCE RADAR (SSR) SYSTEMS Final Report [EFFETI DELLE INTERFERENCE SULLA STIMA MONOPULSE IN SISTEMI SSR]

G. Biffi Gentili and D. Giuli *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 347-358 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

The behavior is analyzed of some monopulse receivers in the presence of interference which limits their performance when employed in SSR systems. Particularly some statistical parameters are evaluated which characterize adequately the effects of both active and passive interference. Some numerical results are presented which allow different receiver configurations to be compared. Author (ESA)

N80-14095# Istituto di Elettronica e Telecomunicazioni, Pisa (Italy).

ARCHITECTURE OF THE SINGLE REPLY DETECTOR-PROCESSOR OF THE SECONDARY SURVEILLANCE RADAR (SSR) OF A DISCRETE ADDRESS BEACON SYSTEM (DABS) Final Report [CARATTERISTICHE OPERATIVE DEL SOTTOSISTEMA RIVELATORE-QUANTIZZATORE PER LA FUNZIONE SSR DI UN SISTEMA DABS]

G. Marchetti, F. Russo, and L. Verrazzani *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 369-378 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

The system architecture of a reply processor designed with particular regard to the decoding-degarbling problem of SSR replies in a DABS is described. The topics discussed include introductory remarks on the logical operations of the system, a pulse detector and a video pulse quantizer designed to accept a clock frequency equal to 16.55 MHz, a framing pulse pairs detector, and a decoder unit. Author (ESA)

N80-14096# Istituto di Elettronica e Telecomunicazioni, Pisa (Italy).

PERFORMANCE CHARACTERISTICS OF THE DETECTOR-QUANTIZER SUBSYSTEM OF THE SECONDARY SURVEILLANCE RADAR (SSR) FUNCTION OF A DISCRETE ADDRESS BEACON SYSTEM (DABS) Final Report [CARATTERISTICHE OPERATIVE DEL SOTTOSISTEMA RIVELATORE-QUANTIZZATORE PER LA FUNZIONE SSR DI UN SISTEMA DABS]

G. Marchetti, G. Picchi, and L. Verrazzani *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 369-378 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)

Avail: NTIS HC A21/MF A01

The pulse detection and estimation process in sweep time is analyzed and results are presented. A simplified model of the dectector-estimator is tested to evaluate the SSR receiver operating characteristics, i.e. pulse detection and false-alarm generation. The video pulse quantizer performances are also derived in the absence and in the presence of interference. It is shown that experimental results are in good agreement with the theoretical model, and that the proposed video pulse quantizer solves most of the cases of interference between two pulses. Author (ESA)

N80-14097# Istituto di Elettronica e Telecomunicazioni, Pisa (Italy).
AZIMUTH DISCRIMINATION OF THE SECONDARY SURVEILLANCE RADAR (SSR) SECTION OF A DISCRETE ADDRESS BEACON SYSTEM (DABS) Final Report [DISCRIMINAZIONE IN AZIMUTH DELLA SEZIONE SSR DI UN SISTEMA DABS]
G. Marchetti, G. Picchi, and L. Verrazzani *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 379-389 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The degarbling performance of a SSR data processing system is analyzed. The efficiency of such operation is shown to depend on the thermal noise effect on the angle estimation, since all other causes are stationary during a sweep period. A monopulse estimator in analyzed which compares the amplitudes of the signals obtained from the sum and the difference channels, using the first as a synchronous detector. Author (ESA)

N80-14098# Compagnia Italiana Servizi Tecnici, Rome.
ANALYSIS OF THE SIDE LOBE SUPPRESSION (SLS) AND RECEIVE SIDE LOBE SUPPRESSION (RSLS) FUNCTIONS OF SECONDARY RADAR Final Report [ANALISI DELLE FUNZIONI SLS ED RSLS PER IL RADAR SECONDARIO]
G. Marchetti, G. Picchi, and L. Verrazzani *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 391-401 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The SLS function of a secondary surveillance radar/discrete address system is analyzed, and the radiation pattern characteristics of the ideal control antenna are deduced. Regarding the RSLS function a new solution is suggested, consisting of the combined use of the three beams in order to obtain a steeper azimuth window. The optimal operative conditions were determined in the presence of differential lobing. The effects of interference on the RSLS is analyzed, and a simple implementation of the frame pulse pairs detector is proposed to reduce the probability of missing mainbeam replies. Author (ESA)

N80-14099# Florence Univ. (Italy). Ist. di Elettronica.
ANALYSIS OF THE CORRELATION ALGORITHMS USED BY THE MONOPULSE SECONDARY SURVEILLANCE RADAR DWELL-TIME PROCESSOR Final Report [ANALISI DEGLI ALGORITMI DI CORRELAZIONE UTILIZZATI DALL'ESTRATTORE SSR MONOPULSE A LIVELLO DI TEMPO DI ILLUMINAZIONE DEL BERSAGLIO]
G. Benelli, E. DalleMese (Pisa Univ., Italy), M. Fossi, and D. Giuli *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 403-413 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

An analytical procedure to evaluate the performance of the dwell-time processor (DTP) section of monopulse secondary surveillance radar (SSR) is described. The procedure utilizes a simplified version of the correlation algorithms of the signals processed by the SSR section of the discrete address beacon system. The analysis is based upon mathematical models of the data estimates developed by the reply time processor. The procedure allows for a parametric functional analysis of the DTP, and may be generalized by varying the correlation algorithm.
Author (ESA)

N80-14100# Selenia S.p.A., Rome (Italy).
ANTIREFLECTION TECHNIQUES FOR DETECTING FALSE TRACKS IN AIR TRAFFIC SURVEILLANCE WITH SECONDARY RADAR Final Report [TECHNICHE ANTIRIFLESSIONE PER LA INDIVIDUAZIONE DELLE FALSE TRACCE NELLA SORVEGLIANZA AEREA CON RADAR SECONDARI]
G. Fraschetti, D. Giuli (Florence Univ.), and V. Sacco (Florence Univ.) *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 415-424 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Algorithms are presented which allow the target reports to be processed for false target and false track detection in order to avoid the consequent problems in secondary surveillance radar systems. The procedure is based upon the following characteristics of false tracks due to reflections: (1) same codes for false and true reports, (2) same elevation, (3) larger distance for the false report, (4) corresponding azimuth of the false report with that of a fixed obstacle, and (5) correlation is kept between both reports of the same radar sweep. Experimental results are presented, showing that 2.74% of the reports were declared false, while 2.42% of those reports were correlated with a false track. Author (ESA)

N80-14101# Bologna Univ. (Italy). Ist. di Elettronica.
ARCHITECTURE AND ANALYSIS OF THE PERFORMANCE OF THE DATA PROCESSOR FOR THE SENSOR CHANNEL OF A DISCRETE ADDRESS BEACON SYSTEM Final Report [ARCHITETTURA ED ANALISI DELLE PRESTAZIONI DELL'ELABORATORE PER IL CONTROLLO DEL CANALE DEL SENSORE DABS]
G. Bucci, D. Maio, and P. Tiberio *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 425-438 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

Several requirements and constraints to increase system efficiency are discussed, starting with a description of the overall structure of a DABS channel management system. A method for evaluation the software overhead is presented and applied to the evaluation of the time spent in a synchronization primitive. A possible alternative architecture with increased through put capabilities is outlined. Author (ESA)

N80-14102# Selenia S.p.A., Rome (Italy).
A METHOD FOR THE FRAME DEFINITION OF A DISCRETE ADDRESS BEACON SYSTEM (DABS) Final Report [METODO PER LA DEFINIZIONE DELLA 'TRAMA' DI UN SISTEMA DABS]
G. Roselli and G. Fraschetti *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 439-450 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A method to dimension the DABS frame is described. The environmental features, the main system parameters, and the scheduling algorithm employed are taken into account. First, the distribution of the number of interrogations is evaluated, assuming a certain number of aircraft in the beam, with a maximum of three interrogations per aircraft. Then the global detection probability is determined, taking into account factors such as duty cycle, scheduling time, and DABS frame structure. The SSR-DABS frame is dimensioned based upon the technical specifications, and the main system parameters. Author (ESA)

N80-14103# Selenia S.p.A., Rome (Italy). Industrie Elettroniche Associate.
THE IMPLEMENTATION OF A SECONDARY SURVEILLANCE RADAR (SSR)/DISCRETE ADDRESS BEACON SYSTEM (DABS) PROJECT Final Report [ASPETTO REALIZZATIVI CONCERNENTI IL PROGETTO SSR/DABS]
R. Chirici and R. Ronconi *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 451-465 In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The implementation of a solid state transmitter and a logarithm amplifier on a monopulse receiver are discussed, and attainable azimuth accuracy is evaluated. The selection of the power transistor type is referred to the waveform, duty cycle, and failure analysis. Several solutions for the implementation of the logarithmic receiver are examined, pointing out the linearity characteristics and the alignment between the two receiving channels referred to thermal disturbances. The azimuth accuracy is related to the effects of the logarithmic amplifier noise and to the antenna characteristics which are assumed to be of a conventional sum/difference type. Author (ESA)

N80-14104# Trieste Univ. (Italy). Ist. di Elettrotecnia ed Elettronica.
AUTOMATIC SYSTEMS FOR AIRPORT SURFACE MOBILE MEDIA SURVEILLANCE BASED ON THE USE OF SECOND-

ARY MEDIA Final Report [SISTEMI AUTOMATICI PER LA SORVEGLIANZA DEI MEZZI MOBILI SU UNA SUPERFICIE AEROPORTUALE BASATI SULL'USO DEL RADAR SECONDARIO]
E. Carli, T. Corzani, G. Falciasecca (Bologne Univ.), F. Ferdani (Fond. Ugo Bordoni), L. Mania, and F. Vatalaro *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 467-476 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

The studies carried out on airport surface surveillance systems suggest the use of secondary radar for a fully automated solution. Some techniques tried in other countries are first reviewed and then an original one is advanced. It is based on the combination of the hyperbolic/azimuth interrogation and the side lobe suppression technique. The system can be implemented with free space propagation, or by means of open waveguides. The open waveguide propagation is the more promising one but its feasibility is conditioned to the design of a suitable structure. Some significant results are presented. Author (ESA)

N80-14105# Politecnico di Torino (Italy). Ist. di Elettronica e Telecommunicazioni.
ONBOARD COLLISION AVOIDANCE SYSTEM: ENVIRONMENTAL INFLUENCE ON THE TRACKING ALGORITHM REQUIREMENTS Final Report [SISTEMI DI ANTICOLLISIONE DI BORDO: INFLUENZE DELL'AMBIENTE OPERATIVO SUI REQUISITI DEGLI ALGORITMI DI TRACKING]
V. Castellani and M. Pent *In* Fond. Ugo Bordoni On Radar in Air Traffic Control Jul. 1979 p 477-486 refs In ITALIAN; ENGLISH summary (For primary document see N80-14065 05-04)
Avail: NTIS HC A21/MF A01

A simulation program was studied to assess the performance of an airborne secondary surveillance radar collision avoidance system. Some first qualitative results are given, and the implementation of tracking and prediction algorithms is discussed. The problem of preventing interference effects is discussed showing the need for the development of suitable algorithms to that effect. Author (ESA)

N80-14106# Arinc Research Corp., Santa Ana, Calif.
AVIONICS INSTALLATION (AVSTALL) COST MODEL FOR USER EQUIPMENT OF NAVSTAR GLOBAL POSITIONING SYSTEM
W. Stewart, D. Allen, and P. Orth Jun. 1979 48 p
(Contract F04701-78-C-0124)
(AD-A073681; Rept-1727-04-1-1959) Avail: NTIS HC A03/MF A01 CSCL 17/7

An avionics installation (AVSTALL) cost model developed for application to the NAVSTAR Global Positioning System (GPS) is described. The model determines the aircraft-peculiar costs of installing avionics equipment--for example, GPS user equipment--into military aircraft. It is based on cost estimating relationships (CERs) developed from an analysis of 51 previous Class V avionics modifications to Air Force aircraft. The development and application of these CERs are explained in this report. GRA

N80-14031# Defence Research Establishment, Ottawa. (Ontario).
DEVELOPMENT OF AIDING GPS/STRAPDOWN INERTIAL NAVIGATION SYSTEM
D. F. Liang, D. B. Reid (Lapp (Philip A.) Ltd., Toronto), R. H. Johnson (S and S Software Ltd., Ottawa), and B. G. Fletcher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 15 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14034# Twente Univ. of Technology, Enschede (Netherlands). Dept. of Electrical Engineering.
METHODS FOR STRAP-DOWN ATTITUDE ESTIMATION AND NAVIGATION WITH ACCELEROMETERS
R. P. Offereins and M. J. L. Tiernego *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 20 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N80-14107* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTICALLY SWEPT ROTOR Patent
Fredric H. Schmitz, Donald A. Boxwell, and Rande Vause, inventors (to NASA) Issued 25 Sep. 1979 23 p Filed 8 Sep. 1977 Supersedes N77-31130 (15 - 22, p 2893)
(NASA-Case-ARC-11106-1; US-Patent-4,168,939; US-Patent-Appl-SN-831633; US-Patent-Class-416-228; US-Patent-Class-416-238; US-Patent-Class-415-199) Avail: US Patent and Trademark Office CSCL 01C

Impulsive noise reduction is provided in a rotor blade by acoustically sweeping the chord line from root to tip so that the acoustic radiation resulting from the summation of potential singularities used to model the flow about the blade tend to cancel for all times at an observation point in the acoustic far field. Official Gazette of the U.S. Patent and Trademark Office

N80-14108* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
QUIET SHORT-HAUL RESEARCH AIRCRAFT FAMILIARIZATION DOCUMENT
Robert C. McCracken Nov. 1979 96 p
(NASA-TM-81149; A-7975) Avail: NASA. Ames Res. Center, Moffett Field, Calif. 94035 CSCL 01C

The design features and general characteristics of the NASA Quiet Short-Haul Research Aircraft are described. Aerodynamic characteristics and performance are discussed based on predictions and early flight-test data. Principle airplane systems, including the airborne data-acquisition system, are also described. The aircraft was designed and built to fulfill the need for a national research facility to explore the use of upper surface-blowing propulsive-lift technology in providing short takeoff and landing capability, and perform advanced experiments in various technical disciplines such as aerodynamics, propulsion, stability and control, handling qualities, avionics and flight-control systems, trailing-vortex phenomena, acoustics, structure and loads, operating systems, human factors, and airworthiness/certification criteria. An unusually austere approach using experimental shop practices resulted in a low cost and high research capability. Author

N80-14109# Aerospace Engineering Test Establishment, Cold Lake (Alberta).
DETERMINATION OF THE REPEATABILITY OF PEC
R. D. Michas 23 Oct. 1979 37 p refs
(AETE-PR-79/36; CF-5) Avail: NTIS HC A03/MF A01

Position error calibrations conducted on four CF-5A, six CF-5 A/R, and five CF-5D aircraft using the standard tower fly by and pacing methods are discussed. The variation in position error, between individual aircraft of each type is examined. Ammendments to the position error correction charts for the CF-5A and CF-5D Aircraft Operation Instruction and redesign of the correction cam are discussed. A.W.H.

N80-14110*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL INVESTIGATION OF THE FLOW CORRECTION FOR A MODEL-MOUNTED ANGLE OF ATTACK SENSOR AT ANGLES OF ATTACK FROM -10 DEG TO 110 DEG
Thomas M. Moul Nov. 1979 20 p refs
(NASA-TM-80189) Avail: NTIS HC A02/MF A01 CSCL 01C

A preliminary wind tunnel investigation was undertaken to determine the flow correction for a vane angle of attack sensor over an angle of attack range from -10 deg to 110 deg. The sensor was mounted ahead of the wing on a 1/5 scale model of a general aviation airplane. It was shown that the flow correction was substantial, reaching about 15 deg at an angle of attack of 90 deg. The flow correction was found to increase as the sensor was moved closer to the wing or closer to the fuselage. The

experimentally determined slope of the flow correction versus the measured angle of attack below the stall angle of attack agreed closely with the slope of flight data from a similar full scale airplane. Author

N80-14111# Dreyfuss-Pellman Corp., Stamford, Conn.
NON-CONTACTING ELECTRO-OPTICAL CONTOURING OF HELICOPTER ROTOR BLADES Final Report, Oct. 1977 Oct. 1978
Marc G. Dreyfus and Arnold Pellman 11 Dec. 1978 80 p
(Contract DAAK50-78-C-0008)
(AD-A070806; USAAVRADCOM-TR-79-30) Avail: NTIS HC A05/MF A01 CSCL 01/3

Non-contact contour measurements of helicopter rotor blades to accuracies of 0.0001 in. are possible via range finding by triangulation employing electro-optical techniques. A laboratory breadboard of such a system has been built and tested. The results of these tests indicate that the construction of a full prototype system is feasible and desirable. GRA

N80-14112# Army Missile Material Readiness Command, Redstone Arsenal, Ala. Cost Analysis Div.
TARGET MISSILE AIRFRAME COSTS
William P. Anderson Mar. 1979 22 p refs
(AD-A073314; DRSMI-FC-79-1) Avail: NTIS HC A02/MF A01 CSCL 05/1

A parametric method of estimating the production cost for a proposed TARGET Missile Airframe is presented in this report. A cost estimating relationship (CER) has been developed based upon an independent variable, the estimated airframe weight in pounds. The independent variable (Y) in the CER, Y = (A-Bx) squared, represents the average unit production cost for the first 700 airframes produced in terms of FY 77 constant dollars. The methodology used in developing this CER, as well as a presentation of data and TARGET Missile Technical Descriptions, is included for the benefit of the cost estimator. GRA

N80-14042# Litton Systems (Canada) Ltd., Rexdale, (Ontario).
A HIGH ACCURACY FLIGHT PROFILE DETERMINING SYSTEM
Peter Roy Vousden and Peter Jonathon Gollop *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 16 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14043# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
INTEGRATION OF FLIGHT AND FIRE CONTROL
Robert K. Huber *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation and 35 Instrumentation and Photography*.

N80-14113*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL SYSTEM FOR DYNAMIC TURBINE ENGINE BLADE DISPLACEMENT MEASUREMENTS
Louis J. Kiraly 13 Mar. 1979 13 p refs Proposed for presentation at 25th Ann. Intern. Gas Turbine Conf. and the 22d Ann. Fluids Engr. Conf., New Orleans, 9-13 Mar. 1980; sponsored by Am. Soc. of Mech. Engr.
(NASA-TM-81382; E-288) Avail: NTIS HC A02/MF A01 CSCL 21E

An instrumentation concept for measuring blade tip displacements which employs optical probes and an array of microcomputers is presented. The system represents a hitherto unknown instrumentation capability for the acquisition and direct digitization of deflection data concurrently from all of the blade tips of an operational engine rotor undergoing flutter or forced vibration. System measurements are made using optical transducers which are fixed to the case. Measurements made in this way are the equivalent of those obtained by placing three surface-normal displacement transducers at three positions on each blade of an operational rotor. M.M.M.

N80-14114*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY TEST RESULTS OF A FLIGHT MANAGEMENT ALGORITHM FOR FUEL CONSERVATIVE DESCENTS IN A TIME BASED METERED TRAFFIC ENVIRONMENT
Charles E. Knox and Dennis G. Cannon (Boeing Commercial Airplane Co., Seattle, Wash.) Nov. 1979 34 p refs
(NASA-TM-80194) Avail: NTIS HC A03/MF A01 CSCL 01D

A flight management algorithm designed to improve the accuracy of delivering the airplane fuel efficiently to a metering fix at a time designated by air traffic control is discussed. The algorithm provides a 3-D path with time control (4-D) for a test B 737 airplane to make an idle thrust, clean configured descent to arrive at the metering fix at a predetermined time, altitude, and airspeed. The descent path is calculated for a constant Mach/airspeed schedule from linear approximations of airplane performance with considerations given for gross weight, wind, and nonstandard pressure and temperature effects. The flight management descent algorithms and the results of the flight tests are discussed. A.W.H.

N80-14018*# Milco International, Inc., Huntington Beach, Calif.
STATE OF THE ART FOR DIGITAL AVIONICS AND CONTROLS, 1978
Richard K. Smyth *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 20 p refs (For primary document see N80-14017 05-01)
(Contract NASw-2891)
Avail: NTIS HC A16/MF A01 CSCL 02A

N80-14022# Singer-Kearfott, Wayne, N. J.
FORTRAN FOR AVIONICS
Austin J. Maher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 8 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14024# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
AUTOMATIC RECOVERY AFTER SENSOR FAILURE ONBOARD
Marc Labarrere, Marc Pelegrin, and Marc Pircher *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14028# Electronique Marcel Dassault, St. Cloud (France).
THE INTEGRITY OF ONBOARD COMPUTER PROGRAMS: A SOLUTION [L'INTEGRITE DES LOGICIELS EMBARQUES: UNE SOLUTION]
G. Germain *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 8 p refs In FRENCH (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14037# Electronique Marcel Dassault, St. Cloud (France).
THE AVIONICS COMPUTER PROGRAM: PRACTICAL EXPERIENCES WITH A METHODOLOGY [LOGICIEL AVIONIQUE: EXPERIENCES PRATIQUES D'UNE METHODOLOGIE]
J. Perin *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 17 p In FRENCH (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.*

N80-14115*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE) ACOUSTIC AND AERODYNAMIC TESTS ON A SCALE MODEL OVER-THE-WING THRUST REVERSER AND FORWARD THRUST NOZZLE
D. L. Stimpert 18 Jan. 1978 85 p refs
(Contract NAS3-18021)
(NASA-CR-135254; R75AEG504) Avail: NTIS HC A05/MF A01 CSCL 21E

An acoustic and aerodynamic test program was conducted on a 1/6.25 scale model of the Quiet, Clean, Short-Haul Experimental Engine (QCSEE) forward thrust over-the-wing (OTW) nozzle and OTW thrust reverser. In reverse thrust, the effect of reverser geometry was studied by parametric variations in blocker spacing, blocker height, lip angle, and lip length. Forward thrust nozzle tests determined the jet noise levels of the cruise and takeoff nozzles, the effect of opening side doors to achieve takeoff thrust, and scrubbing noise of the cruise and takeoff jet on a simulated wing surface. Velocity profiles are presented for both forward and reverse thrust nozzles. An estimate of the reverse thrust was made utilizing the measured centerline turning angle. Author

N80-14116*# General Electric Co., Cincinnati, Ohio. Advanced Engineering and Technology Programs Dept.
QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE). UNDER-THE-WING (UTW) ENGINE BOILERPLATE NACELLE TEST REPORT. VOLUME 2: AERODYNAMICS AND PERFORMANCE
31 Dec. 1977 61 p refs
(Contract NAS3-18021)
(NASA-CR-135250; R77AEG2122-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 21E

The initial phase of testing of the under the wing engine and boilerplate nacelle components is discussed. The aerodynamics and performance are outlined. M.M.M.

N80-14117*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
QUIET, CLEAN, SHORT-HAUL, EXPERIMENTAL ENGINE (QCSEE) UNDER-THE-WING (UTW) ENGINE ACOUSTIC DESIGN
H. D. Sowers and W. E. Coward Jan. 1978 62 p refs
(Contract NAS3-18021)
(NASA-CR-135267; R78AEG195) Avail: NTIS HC A04/MF A01 CSCL 21E

The acoustic considerations involved in the low source noise basic engine design and the design procedures followed in the development of the under-the-wing (UTW) engine boilerplate and composite nacelle acoustic treatment designs are presented. Laboratory experiments, component tests, and scale model and engine tests supporting the UTW engine acoustic design are referenced. Acoustic design features include a near-sonic inlet, low fan and core pressure ratios, low fan tip speed, high and low frequency stacked core treatment, multiple thickness treatment, and fan frame and stator vane treatment. R.E.S.

N80-14118*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
QUIET, CLEAN, SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE) OVER-THE-WING (OTW) ENGINE ACOUSTIC DESIGN
H. D. Sowers and W. E. Coward Jun. 1978 58 p refs
(Contract NAS3-18021)
(NASA-CR-135268; R76AEG228) Avail: NTIS HC A04/MF A01 CSCL 21E

The acoustic considerations involved in the low source noise basic engine design and the design procedures followed in the development of the over-the-wing (OTW) nacelle acoustic treatment design are presented. Laboratory experiments, component tests, and scale model and engine tests supporting the OTW engine acoustic design are referenced. Acoustic design features include a near-sonic inlet, low fan and core pressure ratios, low fan tip speed, high and low frequency stacked core treatment, multiple thickness treatment, and fan frame and stator vane treatment. R.E.S.

N80-14119*# General Electric Co., Cincinnati, Ohio. Advanced Engineering and Technology Programs Dept.
QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE) UNDER-THE-WING (UTW) GRAPHITE/PMR COWL DEVELOPMENT
C. L. Ruggles Jul. 1978 75 p refs
(Contract NAS3-18021)
(NASA-CR-135279; R78AEG208) Avail: NTIS HC A04/MF A01 CSCL 21E

The PMR process development, tooling concepts, testing conducted to generate materials properties data, and the fabrication of a subscale model of the inner cowl are presented. It was concluded that the materials, processes, and tooling concepts were satisfactory for making an inner cowl with adequate structural integrity. M.M.M.

N80-14120*# General Electric Co., Cincinnati, Ohio. Advanced Engineering and Technology Programs Dept.
QUIET CLEAN SHORT-HAUL EXPERIMENTAL ENGINE (QCSEE) OVER-THE-WING (OTW) PROPULSION SYSTEM TEST REPORT. VOLUME 2: AERODYNAMICS AND PERFORMANCE
Jul. 1978 49 p refs
(Contract NAS3-18021)
(NASA-CR-135324; R77AEG474-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 21E

The design and testing of the over the wing engine, a high bypass, geared turbofan engine, are discussed. The propulsion system performance is examined for uninstalled performance and installed performance. The fan aerodynamic performance and the D nozzle and reverser thrust performance are evaluated. A.W.H.

N80-14121*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATIC TEST-STAND PERFORMANCE OF THE YF-102 TURBOFAN ENGINE WITH SEVERAL EXHAUST CONFIGURATIONS FOR THE QUIET SHORT-HAUL RESEARCH AIRCRAFT (QSRA)
Jack G. McArdle, Leonard Homyak, and Allan S. Moore Nov. 1979 62 p
(NASA-TP-1556; E-019) Avail: NTIS HC A04/MF A01 CSCL 21E

The performance of a YF-102 turbofan engine was measured in an outdoor test stand with a bellmouth inlet and seven exhaust-system configurations. The configurations consisted of three separate-flow systems of various fan and core nozzle sizes and four confluent-flow systems of various nozzle sizes and shapes. A computer program provided good estimates of the engine performance and of thrust at maximum rating for each exhaust configuration. The internal performance of two different-shaped core nozzles for confluent-flow configurations was determined to be satisfactory. Pressure and temperature surveys were made with a traversing probe in the exhaust-nozzle flow for some confluent-flow configurations. The survey data at the mixing plane, plus the measured flow rates, were used to calculate the static-pressure variation along the exhaust nozzle length. The computed pressures compared well with experimental wall static-pressure data. External-flow surveys were made, for some confluent-flow configurations, with a large fixed rake at various locations in the exhaust plume. A.R.H.

N80-14122*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
FEASIBILITY OF SiC COMPOSITE STRUCTURES FOR 1644 K (2500 F) GAS TURBINE SEAL APPLICATION Final Report, 28 Apr. - 30 May 1979
R. Darolia Nov. 1979 120 p ref

(Contract NAS3-20082)
(NASA-CR-159597; R79AEG625) Avail: NTIS HC A06/MF A01 CSCL 21E

The silicon carbide composites evaluated consisted of Si/SiC and sintered silicon carbide as substrates, both with attached surface layers containing BN as an additive. A total of twenty-eight candidates with variations in substrate type and density, and layer chemistry, density, microstructure, and thickness were evaluated for abradability, cold particle erosion resistance, static oxidation resistance, ballistic impact resistance, and fabricability. BN-free layers with variations in density and pore size were later added for evaluation. The most promising candidates were evaluated for Mach 1.0 gas oxidation/erosion resistance from 1477 K (2200 F) to 1644 K (2500 F). The as-fabricated rub layers did not perform satisfactorily in the gas oxidation/erosion tests. However, preoxidation was found to be beneficial in improving the hot gas erosion resistance. Overall, the laboratory and rig test evaluations show that material properties are suitable for 1477 K (2200 F) gas turbine seal applications. Further improvements are needed in hot gas erosion resistance and abradability to demonstrate feasibility to 1644 K (250 F). A.R.H.

N80-14123*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC RESPONSE OF A MACH 2.5 AXISYMMETRIC INLET AND TURBOJET ENGINE WITH A POPPET-VALVE CONTROLLED INLET STABILITY BYPASS SYSTEM WHEN SUBJECTED TO INTERNAL AND EXTERNAL AIRFLOW TRANSIENTS
Bobby W. Sanders Washington Jan. 1980 102 p refs
(NASA-TP-1531; E-9467) Avail: NTIS HC A06/MF A01 CSCL 21E

The throat of a Mach 2.5 inlet that was attached to a turbojet engine was fitted with a poppet-valve-controlled stability bypass system that was designed to provide a large, stable airflow range. Propulsion system response and stability bypass performance were determined for several transient airflow disturbances, both internal and external. Internal airflow disturbances included reductions in overboard bypass airflow, power lever angle, and primary-nozzle area as well as compressor stall. For reference, data are also included for a conventional, fixed-exit bleed system. The poppet valves greatly increased inlet stability and had no adverse effects on propulsion system performance. Limited unstarted-inlet bleed performance data are presented. Author

N80-14124*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBOJET-EXHAUST-NOZZLE SECONDARY-AIRFLOW PUMPING AS AN EXIT CONTROL OF AN INLET-STABILITY BYPASS SYSTEM FOR A MACH 2.5 AXISYMMETRIC MIXED-COMPRESSION INLET
Bobby W. Sanders Jan. 1980 82 p refs
(NASA-TP-1532; E-9468) Avail: NTIS HC A05/MF A01 CSCL 21E

The throat of a Mach 2.5 inlet that was attached to a turbojet engine was fitted with large, porous bleed areas to provide a stability bypass system that would allow a large, stable airflow range. Exhaust-nozzle, secondary-airflow pumping was used as the exit control for the stability bypass airflow. Propulsion system response and stability bypass performance were obtained for several transient airflow disturbances, both internal and external. Internal airflow disturbances included reductions in overboard bypass airflow, power lever angle, and primary-nozzle area, as well as compressor stall. Nozzle secondary pumping as a stability bypass exit control can provide the inlet with a large stability margin with no adverse effects on propulsion system performance. Author

N80-14125*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF DEGREE OF FUEL VAPORIZATION UPON EMISSIONS FOR A PREMIXED PARTIALLY VAPORIZED COMBUSTION SYSTEM
Larry P. Cooper Jan. 1980 25 p refs
(NASA-TP-1582; E-010) Avail: NTIS HC A02/MF A01 CSCL 21E

An experimental and analytical study of the combustion of partially vaporized fuel-air mixtures was performed to assess the impact of the degree of fuel vaporization upon emissions for a premixing-prevaporizing flametube combustor. Data collected in this study showed near linear increases in nitric oxide emissions with decreasing vaporization at equivalence ratios of 0.6. For equivalence ratios of 0.7?, the degree of vaporization had very little impact on nitric oxide emissions. A simple mechanism which accounts for the combustion of liquid droplets in partially vaporized mixtures was found to agree with the measured results with fair accuracy with respect to both trends and magnitudes. Author

N80-14126*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA BROAD-SPECIFICATION FUELS COMBUSTION TECHNOLOGY PROGRAM: STATUS AND DESCRIPTION
James S. Fear 1979 14 p refs Presented at 25th Ann. Intern. Gas Turbine Conf., New Orleans, 9-13 Mar. 1980; sponsored by Am. Soc. of Mech. Engr.
(NASA-TM-79315; E-272) Avail: NTIS HC A02/MF A01 CSCL 21E

The program presented is a contracted effort to evolve and demonstrate the technology required to utilize broad-specification fuels in current and next generation commercial Conventional Takeoff and Landing aircraft engines, and to verify this technology in full-scale engine tests in 1983. The program consists of three phases: Combustor Concept Screening, Combustor Optimization Testing, and Engine Verification Testing. The development and screening of the combustion system designs for the CF6-80 engine and the JT9D-7 engine, respectively, in high-pressure sector test rigs are reported. M.M.M.

N80-14127*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
THE CF6 JET ENGINE PERFORMANCE IMPROVEMENT: NEW FRONT MOUNT
W. A. Fasching Dec. 1979 139 p refs
(Contract NAS3-20629)
(NASA-CR-159639; R79AEG366) Avail: NTIS HC A07/MF A01 CSCL 21E

The New Front Mount was evaluated in component tests including stress, deflection/distortion and fatigue tests. The test results demonstrated a performance improvement of 0.1% in cruise sfc, 16% in compressor stall margin and 10% in compressor stator angle margin. The New Front Mount hardware successfully completed 35,000 simulated flight cycles endurance testing. Author

N80-14128*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LASER-OPTICAL BLADE TIP CLEARANCE MEASUREMENT SYSTEM
John P. Barranger and M. John Ford (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) 13 Mar. 1979 10 p refs Proposed for presentation at 25th Ann. Intern. Gas Turbine Conf. and the 22d Ann. Fluids Engr. Conf., New Orleans, 9-13 Mar. 1980; sponsored by Am. Soc. of Mech. Engr.
(NASA-TM-81376) Avail: NTIS HC A02/MF A01 CSCL 21E

A laser-optical measurement system was developed to measure single blade tip clearances and average blade tip clearances between a rotor and its gas path seal in rotating component rigs and complete engines. The system is applicable to fan, compressor and turbine blade tip clearance measurements. The engine mounted probe is particularly suitable for operation in the extreme turbine environment. The measurement system consists of an optical subsystem, an electronic subsystem and a computing and graphic terminal. Bench tests and environmental tests were conducted to confirm operation at temperatures, pressures, and vibration levels typically encountered in an operating gas turbine engine. DOE

N80-14129*# Detroit Diesel Allison, Indianapolis, Ind.
STUDY OF TURBOPROP SYSTEMS RELIABILITY AND MAINTENANCE COSTS Final Report
Jun. 1978 304 p refs
(Contract NAS3-20057)
(NASA-CR-135192; EDR-9132) Avail: NTIS HC A14/MF A01 CSCL 21E

The overall reliability and maintenance costs (R&MC's) of past and current turboprop systems were examined. Maintenance cost drivers were found to be scheduled overhaul (40%), lack of modularity particularly in the propeller and reduction gearbox, and lack of inherent durability (reliability) of some parts. Comparisons were made between the 501-D13/54H60 turboprop system and the widely used JT8D turbofan. It was found that the total maintenance cost per flight hour of the turboprop was 75% higher than that of the JT8D turbofan. Part of this difference was due to propeller and gearbox costs being higher than those of the fan and reverser, but most of the difference was in the engine core where the older technology turboprop core maintenance costs were nearly 70 percent higher than for the turbofan. The estimated maintenance cost of both the advanced turboprop and advanced turbofan were less than the JT8D. The conclusion was that an advanced turboprop and an advanced turbofan, using similar cores, will have very competitive maintenance costs per flight hour. J.M.S.

N80-14130*# Avco Lycoming Div., Williamsport, Pa.
EXHAUST EMISSION REDUCTION FOR INTERMITTENT COMBUSTION AIRCRAFT ENGINES
R. N. Moffett Oct. 1979 114 p
(Contract NAS3-19754)
(NASA-CR-159757) Avail: NTIS HC A06/MF A01 CSCL 21E

Three concepts for optimizing the performance, increasing the fuel economy, and reducing exhaust emission of the piston aircraft engine were investigated. High energy-multiple spark discharge and spark plug tip penetration, ultrasonic fuel vaporization, and variable valve timing were evaluated individually. Ultrasonic fuel vaporization did not demonstrate sufficient improvement in distribution to offset the performance loss caused by the additional manifold restriction. High energy ignition and revised spark plug tip location provided no change in performance or emissions. Variable valve timing provided some performance benefit; however, even greater performance improvement was obtained through induction system tuning which could be accomplished with far less complexity. A.R.H.

N80-14131*# Universal Systems, Inc., Arlington, Va.
OBLIQUE DETONATION WAVE RAMJET
Richard B. Morrison Jan. 1980 87 p refs
(Contract NAS1-15344)
(NASA-CR-159192) Avail: NTIS HC A05/MF A01 CSCL 21E

Two conceptual designs of the oblique detonation wave ramjet are presented. The performance is evaluated for stoichiometric hydrogen-air equivalence ratios of phi = 1/3, 2/3 and 1 for a range of flight Mach numbers from 6 to 10. A.R.H.

N80-14132# Martin Marietta Aerospace, Denver, Colo.
PROPULSION OPTIONS FOR THE HI SPOT LONG ENDURANCE DRONE AIRSHIP Final Report, Nov. 1978 - Aug. 1979
William L. Marcy and Ralph O. Hookway 15 Sep. 1979 55 p refs
(Contract N62269-79-C-0204)
(AD-A074595; MCR-79-632; NADC-78193-60) Avail: NTIS HC A04/MF A01 CSCL 21/5

Airbreathing, monofueled, stored-energy, and solar-rechargeable propulsion systems have been studied for the HI SPOT Long Endurance Drone Airship, providing constant-level electrical power as well as variable aerodynamic thrust to maintain position in winds varying from 15 to 100 knots at high altitude. A hydrogen fueled airbreathing engine is optimum for mission lengths up to 30 days or more. GRA

N80-14133# Naval Postgraduate School, Monterey, Calif.
AN ADAPTATION AND VALIDATION OF A PRIMITIVE VARIABLE MATHEMATICAL MODEL FOR PREDICTING THE FLOWS IN TURBOJET TEST CELLS AND SOLID FUEL RAMJETS M.S. Thesis
Charles Albert Stevenson Jun. 1979 75 p refs
(AD-A074187) Avail: NTIS HC A04/MF A01 CSCL 21/5

An adaptation of a primitive variable, finite-difference computer program was accomplished in order to predict the non-reacting flow fields in turbojet test cells and the reacting flow fields in solid fuel ramjets. The study compares the predictions of the primitive variable computer model with an earlier computer model and empirical data. It was found that the new model reasonably predicted the flow fields in both geometries. In addition, the primitive variable model allowed simulation of test cell flows up to full engine throttle conditions and solid fuel ramjet flows which included an aft mixing chamber. GRA

N80-14134# ARO, Inc., Arnold Air Force Station, Tenn.
APPLICATION OF THE MULTISTAGE AXIAL-FLOW COMPRESSOR TIME-DEPENDENT MATHEMATICAL MODELING TECHNIQUE TO THE TF41-A-1 MODIFIED BLOCK 75 COMPRESSOR Final Report, Jan. 1978 - Mar. 1979
C. E. Chamblee AEDC Sep. 1979 99 p refs
(AD-A074478; AEDC-TR-79-39) Avail: NTIS HC A05/MF A01 CSCL 21/5

A one-dimensional, steady-state TF41-A-1 compressor mathematical model for stability assessment with undisturbed flow, and a three-dimensional time-dependent TF41-A-1 compressor mathematical model for analysis of distorted inflows and transient and dynamic disturbances were developed. Example problems and comparisons to experimental results are presented for both models. The problems using the one-dimensional, steady-state model consisted of determination of the steady-state stability limits (surge lines) with undisturbed flow for three distinct inlet guide vane schedules. Those problems using the three-dimensional, time-dependent model included determination of the stability limit (surge line) reduction caused by pure radial pressure inlet distortion, pure circumferential pressure, and pure circumferential temperature inlet distortion. The effects of rapid upward ramps of inlet temperature on compressor stability were also investigated. The TF41-A-1 compressor models computed the compressor stability limits with reasonable accuracy. GRA

N80-14135# Institut National des Sciences Appliquees, Lyon (France). Lab. de Mecanique de Structures.
ON THE USE OF VIBRATION SELF-DAMPING MATERIALS IN THE MANUFACTURE OF PARTS FOR ROTATING MACHINERY Final Report [UTILISATION DES MATERIAUX AMORTISSANTS POUR LA REALISATION D'ELEMENTS DE MACHINE TOURNANTE]
Michel Lalanne, Phillippe Trompette, David Jones, Johan DerHagopian, and Abdul Hommeida Oct. 1977 124 p refs In FRENCH
(Contract DGRST-75-7-0988)
Avail: NTIS HC A06/MF A01

The control of structural vibration in rotating pieces in the 400C to 600C temperature range by the utilization of damping materials was studied. The test facilities and measuring systems developed for this study are described, including the high temperature measurement of complex modes and frequencies. A computing method for rotating structures with structural damping which was developed in this study is presented, and applied to real cases, such as a stator vane (three dimensional behavior) and a motor element (axisymmetrical structure).
Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-14136*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR STUDY OF STALL/POST-STALL CHARACTERISTICS OF A FIGHTER AIRPLANE WITH RELAXED LONGITUDINAL STATIC STABILITY
Luat T. Nguyen, Marilyn E. Ogburn, William P. Gilbert, Kemper S. Kibler, Phillip W. Brown, and Perry L. Deal Washington Dec. 1979 226 p
(NASA-TP-1538; L-12854) Avail: NTIS HC A11/MF A01 CSCL 01C

A real-time simulation piloted was conducted to evaluate the high-angle-of-attack characteristics of a fighter configuration based on wind-tunnel testing of the F-16, with particular emphasis on the effects of various levels of relaxed longitudinal static stability. The aerodynamic data used in the simulation was conducted on the Langley differential maneuvering simulator, and the evaluation involved representative low-speed combat maneuvering. Results of the investigation show that the airplane with the basic control system was resistant to the classical yaw departure; however, it was susceptible to pitch departures induced by inertia coupling during rapid, large-amplitude rolls at low airspeed. The airplane also exhibited a deep-stall trim which could be flown into and from which it was difficult to recover. Control-system modifications were developed which greatly decreased the airplane susceptibility to the inertia-coupling departure and which provided a reliable means for recovering from the deep stall. Author

N80-14137*# Boeing Commercial Airplane Co., Seattle, Wash.
LINEAR SYSTEMS ANALYSIS PROGRAM, L224(QR). VOLUME 1: ENGINEERING AND USAGE Topical Report, Apr. 1978 - Oct. 1979
P. C. Shah and K. W. Heidergott Dec. 1979 180 p refs
(Contract NAS1-15346; BCS-G0061)
(NASA-CR-2861) Avail: NTIS HC A09/MF A01 CSCL 09B

The QR computer program is described as well as its use in classical control systems analysis and synthesis (root locus, time response, and frequency response). A.R.H.

N80-14138*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOT CONTROL THROUGH THE TAFCOS AUTOMATIC FLIGHT CONTROL SYSTEM
William R. Wehrend, Jr. Dec. 1979 42 p refs
(NASA-TM-81152; A-7996) Avail: NTIS HC A03/MF A01 CSCL 01C

The set of flight control logic used in a recently completed flight test program to evaluate the total automatic flight control system (TAFCOS) with the controller operating in a fully automatic mode, was used to perform an unmanned simulation on an IBM 360 computer in which the TAFCOS concept was extended to provide a multilevel pilot interface. A pilot TAFCOS interface for direct pilot control by use of a velocity-control-wheel-steering mode was defined as well as a means for calling up conventional autopilot modes. It is concluded that the TAFCOS structure is easily adaptable to the addition of a pilot control through a stick-wheel-throttle control similar to conventional airplane controls. Conventional autopilot modes, such as airspeed-hold, altitude-hold, heading-hold, and flight path angle-hold, can also be included. A.R.H.

N80-14139*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ALTITUDE RESPONSE OF SEVERAL AIRPLANES DURING LANDING APPROACH
William H. Phillips Nov. 1979 39 p refs
(NASA-TM-80186) Avail: NTIS HC A03/MF A01 CSCL 01C

The response in altitude and pitching velocity of the shuttle and of four other airplanes during the landing approach is compared. The effects of airplane type, pitch damping, center-of-gravity location, lift coefficient, and cockpit position are presented. The reasons for the differences observed and the effects of these differences on control characteristics are discussed. A.R.H.

N80-14140# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
EXCITATION AND ANALYSIS TECHNIQUE FOR FLIGHT FLUTTER TESTS
G. Haidl and M. Steininger 8 Sep. 1978 27 p refs Presented at 47th SMP/AGARD Meeting, Florence, 24-29 Sep. 1978
(MBB-UF-1446(O)) Avail: NTIS HC A03/MF A01

Excitation methods applied recently for flight flutter testing are surveyed. Examples of excitation by frequency sweep, pseudo-random, harmonic oscillation, and control loop are given and their effectiveness and adaptation to digital processing is discussed. Experience gained in generating aerodynamic forces by control surfaces or additional vanes is reported. The digital analysis of flight flutter test data is then considered. Recommendations for selection of analysis parameters and how to avoid errors due to digital processing are given. For data evaluation in flight flutter tests the autopower spectrum as well as transfer and coherence functions are used. Errors and effects of digital blockwise computation with analysis procedures like block overlapping, windowing, averaging, or curve fitting are demonstrated. The filter correlation and the modal analysis technique are applied for mode separation and damping evaluation based on the above mentioned functions. Practical experience and examples from wind tunnel, flight, and laboratory tests are discussed. An online computer program is presented for realtime calculation of resonance frequencies and damping factors. Author (ESA)

N80-14141# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
STABILITY AND CONTROL ASPECTS OF THE CCV-F104G
H. Beh, U. Korte, and G. Loebert Sep. 1978 33 p refs Presented at AGARD Flight Mech. Panel Meeting on Stability and Control, Ottawa, 25-28 Sept. 1978
(MBB-UFE-1447(O)) Avail: NTIS HC A03/MF A01

The CCV command system, its implementation, and the design of the control laws are described. The superior flight-mechanical performance of the CCV flight control system is compared with that of the basic F 104G on the basis of simulator results. The validity of these results is demonstrated by comparing the principal characteristics of longitudinal and lateral motion measured in flight with the corresponding predicted values. Author (ESA)

N80-14142# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
INVESTIGATION OF THE OSCILLATORY AND FLIGHT BEHAVIOR OF ROTOR SYSTEMS IN RELATION WITH ATMOSPHERIC TURBULENCE [UNTERSUCHUNGEN ZUM SCHWINGUNGS- UND FLUGVERHALTEN VON HUBSCHRAUBERN UNTER ATMOSPHAERISCHER TURBULENZ]
H. Dahl and D. Weger 1979 72 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVG-FBWT-79-5) Avail: NTIS HC A04/MF A01; DOKZENTBw, Bonn DM 30

The effects of stochastic atmospheric disturbances on the performance of various helicopter rotor systems was investigated in order to determine their gust sensitivity. A statistical description of turbulent excitations which permits sufficiently accurate simulation of helicopter oscillatory behavior resulting from gust disturbances was developed. Results show that during low altitude flight and slow speed flight the gust vector distribution over the helicopter is very nonuniform. At any instant therefore, the individual rotor blades are affected by very different gust velocities which leads to different responses of the blades. In conclusion, the investigations pursue the important objective of elaborating and clarifying possibilities for improvement of the flight characteristics of the investigated rotor systems, in so far as the inclusion of special gust reduction systems on helicopters is possible and profitable. Author (ESA)

N80-14143# European Space Agency, Paris (France).
FLIGHT TESTING OF THE BUFFETING BEHAVIOR OF COMBAT AIRCRAFT
G. Redeker Feb. 1979 44 p refs Transl. into ENGLISH of "Flugversuche zum Buffeting-Verhalten von Kampfflugzeugen", Rep. DFVLR-FB-IB-151-78/6 DFVLR, Brunswick, 18 Dec. 1979
(ESA-TT-523; DFVLR-FB-IB-151-78/6) Avail: NTIS HC A03/MF A01

The flight testing of buffeting behavior in combat aircraft is reviewed. After a description of the buffeting phenomenon and its effects on the pilot and the performance of a combat aircraft, flight testing techniques from several American reports are discussed. Author (ESA)

N80-14019# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Flight Control Div.
A FLIGHT CONTROL SYSTEM USING THE DAIS ARCHITECTURE
A. P. DeThomas and R. A. Hendrix *In* AGARD Advan. in

Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14023# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
AN OBSERVER SYSTEM FOR SENSOR FAILURE DETECTION AND ISOLATION IN DIGITAL FLIGHT CONTROL SYSTEMS
Norbert Stuckenberg *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14026# Marconi Avionics Ltd., Rochester (England). Flight Automation Research Lab.
RECENT ADVANCES IN FIBRE OPTICS FOR HIGH INTEGRITY DIGITAL CONTROL SYSTEMS
R. P. G. Collinson *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 16 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14026# General Dynamics/Fort Worth, Tex.
REDUNDANCY MANAGEMENT CONSIDERATIONS FOR A CONTROL-CONFIGURED FIGHTER AIRCRAFT TRIPLEX DIGITAL FLY-BY-WIRE FLIGHT CONTROL SYSTEM
John H. Watson, William J. Yousey, and James M. Railey *In* AGARD Advan. In Guidance and Control Systems Using Digital Tech. Aug. 1979 23 p ref (For primary document see N80-14017 05-01)
(Contract F33615-77-C-3036)
Avail: NTIS HC A16/MF A01

N80-14027# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Aircraft Div.
FAILURE DETECTION, ISOLATION AND INDICATION IN HIGHLY INTEGRATED DIGITAL GUIDANCE AND CONTROL SYSTEM
Wolfgang J. Kubbat *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 17 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14036# Lockheed-Georgia Co., Marietta.
AN ASSESSMENT OF AND APPROACH TO THE VALIDATION OF DIGITAL FLIGHT CONTROL SYSTEMS
D. B. Mulcare and W. G. Ness *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14038# Westland Helicopters Ltd., Yeovil (England).
EXPERIENCE IN PRODUCING SOFTWARE FOR THE GROUND STATION OF A REMOTELY PILOTED HELICOPTER SYSTEM
J. P. Webby, P. L. Wescott, M. I. Tucker, and H. M. Smith *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 9 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N80-14144# Federal Aviation Administration, Washington, D. C.
REFLECTION CRACKING OF BITUMINOUS OVERLAYS FOR AIRPORT PAVEMENTS: A STATE OF THE ART Final Report
Aston L. McLaughlin May 1979 91 p refs
(AD-A073484; FAA-RD-79-57; ARD-430) Avail: NTIS HC A05/MF A01 CSCL 13/2

Methods and practices pursued by various pavement authorities in an effort to reduce the incidence of reflection cracking of bituminous overlays are discussed. The theoretical, analytical and laboratory efforts in this connection are presented. The mechanics of reflection cracking and criteria for design of overlay systems which are resistant to reflection cracking are examined. A.W.H.

N80-14145# Dayton Univ., Ohio.
FEASIBILITY OF UTILIZING LASER DOPPLER VELOCIMETER TECHNIQUES IN VERY CLEAN WIND TUNNELS Final Report, Oct. 1977 - Oct. 1978
James D. Trolinger, Anthony E. Smart, and Virgil A. Cline (Air Force Reserve Program, Wright-Patterson AFB, Ohio) Wright-Patterson AFB, Ohio AFFDL Aug. 1979 26 p refs Prepared in cooperation with Spectron Development Labs., Inc., Costa Mesa, Calif.
(Contract F33615-76-C-3145; AF Proj. 2404)
(AD-A074244; AFFDL-TR-79-3084) Avail: NTIS HC A03/MF A01 CSCL 14/2

A laser Doppler velocimeter was tested in a two-foot transonic wind tunnel under clean flow conditions without artificial seeding. Both the classical and photon correlation modes were tested. Both systems worked initially; however, as the tunnel cleaned up during operation, the classical system ceased producing data within a few minutes of run time and the photon correlation mode ceased function after about twenty minutes. The next step in developing a working system is described. GRA

N80-14146# Battelle Memorial Inst., Columbus, Ohio.
ARC-TUNNEL STAGNATION ENTHALPY MEASUREMENTS UTILIZING THE COPPER-LINE-RATIO METHOD CORRECTED FOR SELF-ABSORPTION EFFECTS Final Report, Nov. 1977 - Oct. 1978
Anthony A. Boiarski Jun. 1979 66 p refs
(Contract F33615-76-C-3145; AF Proj. 2404)
(AD-A074635; AFFDL-TR-79-3068) Avail: NTIS HC A04/MF A01 CSCL 14/2

Detailed measurements of the copper emission spectrum at 5106 A and 5153 A were obtained while observing radiation from the free-stream and model nosecap regions of an arc-heated wind tunnel flow. The ratio of peak line intensities and the absolute width of the 5106 A line were used to infer gas temperature (i.e., enthalpy) and copper density corrected for self-absorption effects. Line shift measurements were also obtained in order to corroborate the use of Lindholm's collision broadening theory in the self-absorption analysis. Final enthalpy results for the peaked profile mode of operation indicated that a significant correction to measured enthalpy resulted when self-absorption was taken into account. The resulting average stagnation enthalpy value of 5250 Btu/lbm was in good agreement with previously obtained results utilizing a combined heat flux and ptiot probe technique. GRA

N80-14147# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INVESTIGATION OF NOISE HAZARDS IN THE ENGINE TEST CELL, CFB BADEN-SOELLINGEN
S. E. Forshaw Jun. 1979 22 p refs
(AD-A074391; DCIEM-TR-79-X23) Avail: NTIS HC A02/MF A01 CSCL 21/5

Although the sound pressure levels occuring in the engine test cell, CFB Baden-Soellingen, are extremely intense (137 dBA) with a J79 engine running at military power, the attenuation provided by Canadian Forces standard-issue earmuffs is sufficient to reduce the noise at operators' ears to more tolerable levels (108 dBA). Moreover, the noise doses sustained during engine check-outs permit average work periods of up to 49 minutes per day in the test cell with engines running. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N80-14148*# National Aeronautics and Space Administration, Washington, D. C.
ANNIVERSARY OF APOLLO 11 MOON LANDING PRESS CONFERENCE
20 Jul. 1979 19 p Tape Transcript
(NASA-TM-80844; P79-10191) Avail: NTIS Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

Proceedings from a conference with the astronauts from the Apollo 11 flight are presented. Topics range from the space shuttle to astronaut training programs. A.W.H.

N80-14149*# National Aeronautics and Space Administration, Washington, D. C.
TENTH ANNIVERSARY OF APOLLO 11 MOON LANDING
20 Jul. 1979 22 p Tape Transcript
(NASA-TM-80473; P79-10192) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The proceedings from the tenth anniversary of the Apollo 11 Moon landing are presented. Future direction of the space programs and space exploration are discussed. A.W.H.

N80-14150*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK Progress Report, Sep. - Oct. 1979
15 Dec. 1979 118 p refs
(Contract NAS7-100)
(NASA-CR-162524; JPL-PR-42-54) Avail: NTIS HC A06/MF A01 CSCL 22D

Deep Space Network progress in flight project support, tracking and data acquisition research and technology, network engineering, hardware and software implementation, and operations is presented. For individual titles, see N80-14151 through N80-14162.

N80-14151*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES c14
N. A. Renzetti *In its* The Deep Space Network 15 Dec. 1979 p 1-3 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 14B

The objectives, functions, and organization of the Deep Space Network are summarized; deep space station, ground communication, and network operations control capabilities are described. Author

N80-14152*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN RADIO SCIENCE SYSTEM, MARK III-80 c32
A. L. Berman *In its* The Deep Space Network 15 Dec. 1979 p 4-18 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 17B

The key characteristics, functional operation, and functional requirements of the DSN Radio Science System, Mark III-80, are described. Particularly emphasized is 'medium bandwidth' capability, which will enable support of the Voyager Saturn Ring Experiment. R.E.S.

N80-14153*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT c15
N. Fanelli and H. Nance *In its* The Deep Space Network 15 Dec. 1979 p 19-23 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 22B

Tracking and data acquisition for Project Voyager is presented and discussed for the postencounter period for Voyager 2 and the Saturn cruise period for Voyager 1. R.E.S.

N80-14154*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PIONEER 11 SATURN ENCOUNTER MISSION SUPPORT c91
R. B. Miller *In its* The Deep Space Network 15 Dec. 1979 p 24-27 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 03B

Pioneer 11 spacecraft flew by the planet Saturn in August and September 1979. The DSN performance during the support of the first Saturn encounter is described. Author

N80-14155*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STABILITY OF THE MULTIMEGABIT TELEMETRY CARRIER LOOP c17
D. W. Brown *In its* The Deep Space Network 15 Dec. 1979 p 28-33 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09F

Basic sampled data loop stability is reviewed; the effect of an additional low-pass filter in the loop is analyzed. Resulting upper bounds on permissible loop bandwidth are established. Author

N80-14156*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EXAMINATION OF ANCILLARY EQUIPMENT FOR A PROPOSED 34.3 GHz HIGH POWER GYROTRON TWT AMPLIFIER c33
A. Kupiszewski *In its* The Deep Space Network 15 Dec. 1979 p 34-40 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

A short review of gyrotron developments and applications is given with attention to both theory and experiments. Parameters for a point design for a gyrotron traveling wave tube amplifier are listed and a detailed examination of ancillary equipment is made. A safety-interlock tree for insuring longer tube life under operating conditions is proposed, and a sequence for turn on/off of the proposed tube is given. In addition, reasoning for the expectation of multimode output is presented. R.E.S.

N80-14157*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF THE VA-878P KLYSTRON FOR THE 20-kW X-BAND UPLINK TRANSMITTER c33
R. B. Kolbly *In its* The Deep Space Network 15 Dec. 1979 p 41-50 ref (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

Initial evaluation test results of the proposed 20 kW X band uplink klystron are presented. Operating parameters are compared with the existing DSN 20 kW S band klystrons. Measured differential RF phase sensitivities vs operating parameter changes are exhibited. Author

N80-14158*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPUTER-AIDED DESIGN SYSTEM FOR CUSTOM LARGE-SCALE INTEGRATED CIRCUITS c33
M. W. Sievers *In its* The Deep Space Network 15 Dec. 1979 p 51-61 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

A high level descriptive language and a SIMULA based language interpreter for defining the logic core of an integrated circuit is described. The interpreter is running on the Caltech DEC SYSTEM 20 computer. It has been used to design a 16 bit self checking comparator of medium scale integration proportions. J.M.S.

N80-14159*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STUDY OF THE INFLUENCE OF OIL SATURATION ON THE 64 METER ANTENNA HYDROSTATIC BEARING GROUT c37
H. P. Phillips, A. A. Riewe, M. Polivka (California Univ., Berkeley), and P. K. Mehta *In its* The Deep Space Network 15 Dec. 1979 p 62-70 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 13I

The effect of oil saturation on the grout supporting the hydrostatic bearing runners in the DSN 64 m antennas was investigated. It is concluded that oil saturation as such did not significantly affect the strength of the concrete in either static

or cyclic loading. The possibility is raised that the presence of oil as the concrete is placed may inhibit the development of the full strength of the material. J.M.S.

N80-14160*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER 1979: UPDATE TO THE RADIAL AND SOLAR CYCLE VARIATIONS IN THE SOLAR WIND PHASE FLUCTUATION SPECTRAL INDEX c92
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1979 p 71-81 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 03B

Columnar spectral index information that has been extracted from a sizable volume of Voyager 1979 solar conjunction Doppler phase fluctuation data is presented. The Voyager 1979 results, when compared to similar information derived from the 1976 Helios and Viking and 1978 Voyager solar conjunctions, lead to the following inferences: (1) there has been a significant change in the spectral index from 1976 to 1978/1979; (2) there is continuing evidence that favors a slight (positive) correlation between the spectral index and the solar (sunspot) cycle; and (3) there is little or no evidence in support of a radial variation of the spectral index. Recently, it has been hypothesized that a flattening of the phase fluctuation spectrum occurs near the sun; these data are at a variance with such a hypothesis. J.M.S.

N80-14161*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EFFICIENT PROGRAM FOR DECODING THE (255,223) REED-SOLOMON CODE OVER GF (2 TO THE 8TH POWER) WITH BOTH ERRORS AND ERASURES, USING TRANSFORM DECODING c81
R. L. Miller, T. K. Truong, and I. S. Reed (Univ. of Southern California) *In its* The Deep Space Network 15 Dec. 1979 p 82-91 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09B

To decode a (255,223) Reed-Solomon code over GF(2 to the 8th power), a fast Fourier-like transform over GF(2 to the 8th power) was developed to compute the syndromes and the error-erasure vectors of the transmitted code words. This simplified transform decoder is implemented in a program on a digital computer. The (255,223) Reed-Solomon code over GF(2 to the 8th power) is a NASA standard for concatenation with a convolutional code. In a simulation, random code words were corrupted by random error and erasure patterns, and decoded whenever theoretically possible. A matrix of execution times for this transform decoder under varying sets of errors and erasure patterns is included. This matrix demonstrates that the speed of the decoder is between 3 and 7 times faster than the standard R-S decoder, developed previously by NASA. J.M.S.

N80-14162*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE MICROPROCESSOR-BASED SYNTHESIZER CONTROLLER c80
H. Donnelly, M. R. Wick, R. W. Weller, G. B. Schaaf, B. Barber, and M. A. Stern *In its* The Deep Space Network 15 Dec. 1979 p 92-103 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09B

The design and implementation plan of a microprocessor based controller for the Dana Digiphase Synthesizer is presented. Improvements over the present controller, POCA, are discussed, including greater operating capability, increased phase control accuracy and the addition of diagnostics. J.M.S.

N80-14163*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DETERMINATION OF ASPS PERFORMANCE FOR LARGE PAYLOADS IN THE SHUTTLE ORBITER DISTURBANCE ENVIRONMENT
Claude R. Keckler, Kemper S. Kibler, and Lawrence F. Powell Oct. 1979 37 p refs
(NASA-TM-80136) Avail: NTIS HC A03/MF A01 CSCL 22A

A high fidelity simulation of the annular suspension and pointing system (ASPS), its payload, and the shuttle orbiter was used to define the worst case orientations of the ASPS and its payload for the various vehicle disturbances, and to determine the performance capability of the ASPS under these conditions. The most demanding and largest proposed payload, the Solar Optical Telescope was selected for study. It was found that, in all cases, the ASPS more than satisfied the payload's requirements. It is concluded that, to satisfy facility class payload requirements, the ASPS or a shuttle orbiter free-drift mode (control system off) should be utilized. A.R.H.

N80-14164*# Analytical Mechanics Associates, Inc., Jericho, N.Y.
RESEARCH IN NAVIGATION AND OPTIMIZATION FOR SPACE TRAJECTORIES Final Report, 1 Oct. 1975 - 30 Sep. 1979
S. Pines and H. J. Kelley 30 Sep. 1979 50 p
(Contract NAS9-14818)
(NASA-CR-160420; AMA-79-20) Avail: NTIS HC A03/MF A01 CSCL 22A

Topics covered include: (1) initial Cartesian coordinates for rapid precision orbit prediction; (2) accelerating convergence in optimization methods using search routines by applying curvilinear projection ideas; (3) perturbation-magnitude control for difference-quotient estimation of derivatives; and (4) determining the accelerometer bias for in-orbit shuttle trajectories. A.R.H.

N80-14165# Centre National d'Etudes Spatiales, Toulouse (France).
FRENCH SPACE PROGRAMS [PROGRAMME SPATIAL FRANCAIS. RAPPORT AU COSPAR]
1979 154 p refs In FRENCH; ENGLISH summary Presented at 22d COSPAR Assembly, Bangalore, India, May - Jun. 1979 Prepared in cooperation with Comite Natl. Franc. de Rech. dans l'Espace, Paris
Avail: NTIS HC A08/MF A01

French activites during 1979 in space research and correlated programs are summarized. The work accomplished in the fields of astronomy, solar system, planet studies, interplanetary medium, ionosphere and magnetospheric physics, aeronomy, meteorology, earth resources, geodesy, life sciences, and material sciences are discussed. Author (ESA)

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N80-14166# British Aerospace Dynamics (Space), Stevenage (England). Electronic and Space Systems.
PARAMETER ESTIMATION FROM SATELLITE TRACKING DATA Final Report
T. A. Morley and E. B. Crellin Jan. 1979 229 p refs
(Contract ESOC-3217/77)
(ESS/SS-919; ESA-CR(P)-1233) Avail: NTIS HC A11/MF A01

The work carried out on processing satellite tracking data to determine improved estimates for many parameters, is described. In the extraction of information from COS-B observations, effort was concentrated on the estimation of measurement biases and the solar radiation pressure coefficient. In several cases convergence to a stable solution were not obtained due to the round off error that arises because of the almost negligible effect of solar radiation pressure on the evolution of the orbit over the duration of the measurement data spans. Consistent estimates for the range biases were not determined from OTS transfer orbit data. However, throughout the study it is evident that range rate measurements are greatly inferior to range measurements for providing information on either the orbital elements or the other uncertain parameters apart from their own associated biases. Some improvement was determined for the estimates of the OTS drag coefficient and the velocity increment of one of the reorientation maneuver. There is good reason to suppose that these estimations were accompanied by more accurate orbit determination. Author (ESA)

N80-14033# McMaster Univ., Hamilton (Ontario).
MICROCOMPUTER-BASED ON-LINE STATE ESTIMATION WITH APPLICATIONS TO SATELLITES
N. K. Sinha, S. Y. Law (Commun. Res. Centre, Ottawa), and R. Mamen *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N80-14151*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NETWORK FUNCTIONS AND FACILITIES
N. A. Renzetti *In its* The Deep Space Network 15 Dec. 1979 p 1-3 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-14167*# National Aeronautics and Space Administration, Washington, D. C.
PRESS CONFERENCE ON SKYLAB
6 Jul. 1979 58 p Tape Transcript
(NASA-TM-80752; P79-10190) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

A discussion on the Skylab reentry date and its predicted effects is presented. The plans for a coordination center and its activities to monitor the reentry of Skylab are discussed. A.W.H.

N80-14168*# National Aeronautics and Space Administration, Washington, D. C.
PRESS BRIEFING: MAGSAT
22 Oct. 1979 27 p
(NASA-TM-80757; P79-10195) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

A discussion of the MAGSAT program is presented. The Earth magnetic mapping mission of the MAGSAT is described. A.W.H.

N80-14169*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TORQUE EQUILIBRIUM ATTITUDE CONTROL FOR SKYLAB REENTRY
John R. Glasoe and Hans F. Kennel Nov. 1979 173 p refs
(NASA-TM-78252) Avail: NTIS HC A08/MF A01 CSCL 22B

All the available torque equilibrium attitudes (most were useless from the standpoint of lack of electrical power) and the equilibrium seeking method are presented, as well as the actual successful application during the 3 weeks prior to Skylab reentry. M.M.M.

N80-14170# Air Force Geophysics Lab., Hanscom AFB, Mass.
ATS-5 AND ATS-6 POTENTIALS DURING ECLIPSE Interim Report
Allen G. Rubin and Henry B. Garrett 27 Sep. 1979 11 p refs
(AD-A074878; AFGL-TR-79-0218) Avail: NTIS HC A02/MF A01 CSCL 22/1

ATS-5 and ATS-6 data for spacecraft charging during eclipse conditions are analyzed. ATS-5 and ATS-6 charged to voltages greater than 100 volts for about 55% of the eclipse periods examined. The mean spacecraft potential during eclipse was 2 keV for ATS-5, and the highest potential measured was 10 kilovolts. For ATS-6, the mean potential during eclipse was 4 keV, the highest potential measured being 20 keV. The average measured spacecraft potentials for both ATS-5 and 6 depend, approximately linearly, upon K sub p. This relationship is due mainly to the dependence of electron current density on K sub p near midnight. Spacecraft potentials at geosynchronous orbit may, to a rough approximation, thus be inferred from ground-based measurements of K sub p, the planetary 3 hour index. GRA

N80-14171# Mark Resources, Inc., Marina Del Rey, Calif.
TMR PROCESSING PROCEDURES FOR GSRS SPIN AND ATTITUDE MEASUREMENTS Final Report, Aug. 1978 - Aug. 1979
B. D. Baker and W. B. Kendall Aug. 1979 77 p
(Contract DAAD07-77-C-0094; DA Proj. 1T6-65804-DE-93) (AD-A074947; MRI-142-31) Avail: NTIS HC A05/MF A01 CSCL 17/9

The use of Target Motion Resolution (TMR) processing of data from the MPS-36 and FPS-16 instrumentation radars at WSMR to produce measurements of the spin and coning motion of the GSRS surface-to-surface missile is described in detail. Actual flight-test data are processed to illustrate the techniques described. New computer software produced for and installed at WSMR to do the described processing is documented. GRA

N80-14172# Control Dynamics Co., Huntsville, Ala.
APPLICATION OF DISCRETE GUIDANCE AND CONTROL THEORY Final Report
S. M. Seltzer Aug. 1979 227 p refs
(Contract DAAK40-78-C-0226)
(AD-A074782; CDC-79-2) Avail: NTIS HC A11/MF A01 CSCL 17/7

During Task II a stability analysis, summary, and implementation associated with the discrete control for a missile system was performed via the parameter space technique. Emphasis was placed upon the development of analytical tools to perform the design and analysis of the system. The three design tools developed under this contract are described: SAM, an Alternative to Sampled-Data Signal Flow Graphs; Determination of Digital Control System Response by Cross-Multiplication; and Sampled-Data Analysis in Parameter Space. The three techniques have been cast in a form amenable to implementation within digital computers or desktop calculators. GRA

N80-14173*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REAL-TIME ISEE DATA SYSTEM
B. T. Tsurutani and D. N. Baker 1979 13 p refs Presented at the Intern. Solar Predictions Workshop, Boulder, Colo. 23 Apr. 1979 Prepared in cooperation with LASL
(Contracts NAS7-100; W-7405-eng-36)
(NASA-CR-162549; LA-UR-79-1660; CONF-790413-4) Avail: NTIS HC A02/MF A01 CSCL 05B

A real-time ISEE data system directed toward predicting geomagnetic substorms and storms is discussed. Such a system may allow up to 60+ minutes advance warning of magnetospheric substorms and up to 30 minute warnings of geomagnetic storms (and other disturbances) induced by high-speed streams and solar flares. The proposed system utilizes existing capabilities of several agencies (NASA, NOAA, USAF), and thereby minimizes costs. This same concept may be applicable to data from other spacecraft, and other NASA centers; thus, each individual experimenter can receive quick-look data in real time at his or her base institution. DOE

N80-14040# Raytheon Co., Bedford, Mass. Missile Systems Div.
FEDERATED MICROCOMPUTER SYSTEMS FOR ON-BOARD MISSILE GUIDANCE AND CONTROL
Frank J. Langley, David S. Siegel (ONR, Arlington, Va.), Wayne F. Savage (NSWC), and Rollin E. Wehman *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug.

1979 15 p refs Sponsored by ONR and NSWC (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14153*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER MISSION SUPPORT
N. Fanelli and H. Nance *In its* The Deep Space Network 15 Dec. 1979 p 19-23 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N80-14174*# National Aeronautics and Space Administration, Washington, D. C.
PRESS BRIEFING ON DR. FROSCH'S MEETING WITH PRESIDENT CARTER REGARDING THE SPACE SHUTTLE
14 Nov. 1979 24 p Tape Transcript
(NASA-TM-80753; P79-10196) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22B

A discussion of the space shuttle program is presented. Topics include estimated costs, launch schedule, payload weight, and presidential support. A.W.H.

N80-14175*# IBM Federal Systems Div., Houston, Texas.
SOFTWARE DESIGN SPECIFICATION. PART 2: ORBITAL FLIGHT TEST (OFT) DETAILED DESIGN SPECIFICATION. VOLUME 3: APPLICATIONS. BOOK 2: SYSTEM MANAGEMENT
16 Oct. 1979 977 p
(Contract NAS9-14444)
(NASA-CR-160389) Avail: NTIS HC A99/MF A01 CSCL 22B

The functions performed by the systems management (SM) application software are described along with the design employed to accomplish these functions. The operational sequences (OPS) control segments and the cyclic processes they control are defined. The SM specialist function control (SPEC) segments and the display controlled 'on-demand' processes that are invoked by either an OPS or SPEC control segment as a direct result of an item entry to a display are included. Each processing element in the SM application is described including an input/output table and a structured control flow diagram. The flow through the module and other information pertinent to that process and its interfaces to other processes are included. J.M.S.

N80-14176*# Martin Marietta Corp., Denver, Colo.
THERMAL PROTECTION SYSTEM FLIGHT REPAIR KIT Final Report
Dec. 1979 75 p
(Contract NAS9-15969)
(NASA-CR-160417; MCR-79-682) Avail: NTIS HC A04/MF A01 CSCL 22B

A thermal protection system (TPS) flight repair kit required for use on a flight of the Space Transportation System is defined. A means of making TPS repairs in orbit by the crew via extravehicular activity is discussed. A cure in place ablator, a precured ablator (large area application), and packaging design (containers for mixing and dispensing) for the TPS are investigated. A.W.H.

N80-14177*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SPACE TRANSPORTATION SYSTEM SHUTTLE TURN ABOUT ANALYSIS REPORT
R. E. Reedy 14 Aug. 1979 151 p refs
(NASA-TM-80840) Avail: NTIS HC A08/MF A01 CSCL 22A

The progress made and the problems encountered by the various program elements of the shuttle program in achieving the 160 hour ground turnaround goal are presented and evaluated. Task assessment time is measured against the program allocation time. R.E.S.

N80-14178# Martin Marietta Corp., Vandenberg AFB, Calif.
DOD STS GROUND SUPPORT SYSTEMS
Rolland E. Bruckner 15 Mar. 1978 74 p
(Contract F04701-78-C-0081)
(VCR-78-032-05) Avail: NTIS HC A04/MF A01

The ground operations systems functions and the turnaround time required to achieve a yearly launch rate of 20 space shuttle vehicles from Vandenburg Air Force Base using two orbiters and one launch pad were analyzed. The VAFB turnaround time requirements are defined. The design reference timelines (DRTs), the assessed timelines and the delta times by station set for the turnaround activities are presented. Problem areas impacting the station set design reference timelines are described and the corrective action, status, and results of related action items or trade studies are considered. Periodic significant scheduled tasks (PSSTs) and unplanned maintenance tasks in support of specific missions are examined. A.R.H.

N80-14179*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SHUTTLE ORBITER TPS FLIGHT REPAIR KIT DEVELOPMENT Final Report
Dec. 1979 100 p
(Contract NAS9-15971)
(NASA-CR-160416; MDC-G8261) Avail: NTIS HC A05/MF A01 CSCL 22B

The design and application of a TPS repair kit is presented. The repair kit is designed for on orbit use by a crew member working in the manned maneuvering unit (MMU). The kit includes the necessary equipment and materials to accomplish the repair tasks which include the following: HRSI emittance coating repair, damaged tile repair, missing tile repair, and multiple tile repair. Two types of repair materials required to do the small area repair and the large area repair are described. The materials area cure in place, silicone base ablator for small damaged areas and precured ablator tile for repair of larger damaged areas is examined. The cure in place ablator is also used as an adhesive to bond the precured tiles in place. An applicator for the cure in place ablator, designed to contain a two-part silicon compound, mix the two components at correct ratio, and dispense the materials at rates compatible with mission timelines established for the EVA is described. A.W.H.

N80-14180*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLIGHT DESIGN SYSTEM-1 SYSTEM DESIGN DOCUMENT. VOLUME 9: EXECUTIVE LOGIC FLOW, PROGRAM DESIGN LANGUAGE
Dec. 1979 449 p
(NASA-TM-80841; JSC-12564) Avail: NTIS HC A19/MF A01 CSCL 22B

The detailed logic flow for the Flight Design System Executive is presented. The system is designed to provide the hardware/software capability required for operational support of shuttle flight planning. J.M.S.

N80-14181*# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
THERMAL PROTECTION SYSTEM REPAIR KIT PROGRAM Final Report
28 Nov. 1979 145 p
(Contract NAS9-15970)
(NASA-CR-160418; Rept-79SDR2310) Avail: NTIS HC A07/MF A01 CSCL 22B

The feasibility and conceptual design aspects of repair materials and procedures for in orbit repair of the space shuttle orbiter TPS tiles are investigated. Material studies to investigate cure in place materials are described including catalyst and cure studies, ablation tests and evaluations, and support mixing and applicator design. The feasibility of the repair procedures, the storage of the TPS, dispensing, and cure problems are addressed. A.W.H.

N80-14029# Hamilton Standard, Farmington, Conn.
A REDUNDANT INERTIAL NAVIGATION SYSTEM FOR IUS
R. A. Baum, G. E. S. Morrison (Boeing Aerospace Co., Seattle, Wash.), and R. C. Peters (Aerospace Corp., Los Angeles, Calif.) *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 11 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N80-14182*# Acurex Corp., Mountain View, Calif. Autodata Div.
PHASE-LOCKED TELEMETRY SYSTEM FOR ROTARY INSTRUMENTATION OF TURBOMACHINERY, PHASE 1 Final Report
Alan Adler and Bao Hoeks Sep. 1978 192 p
(Contract NAS3-20290; Acurex Proj. 6497)
(NASA-CR-159453; Acurex-78-284) Avail: NTIS HC A09/MF A01 CSCL 09F

A telemetry system for use in making strain and temperature measurements on the rotating components of high speed turbomachines employs phase locked transmitters, which offer greater measurement channel capacity and reliability than existing systems which employ L-C carrier oscillators. A prototype transmitter module was tested at 175 C combined with 40,000 g's acceleration. A.R.H.

N80-14185*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
STABILITY OF THE MULTIMEGABIT TELEMETRY CARRIER LOOP
D. W. Brown *In its* The Deep Space Network 15 Dec. 1979 p 28-33 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-14183* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTENNA DEPLOYMENT MECHANISM FOR USE WITH A SPACECRAFT Patent
William A. Leavy and Charles R. Griffin, inventor (to NASA) Issued 27 Nov. 1979 9 p Filed 18 Sep. 1978 Supersedes N78-32436 (16 - 23, p 3088)
(NASA-Case-GSC-12331-1; US-Patent-4,176,360; US-Patent-Appl-SN-943088; US-Patent-Class-343-883; US-Patent-Class-343-880) Avail: US Patent and Trademark Office CSCL 22B

A mechanical system is disclosed to deploy an antenna on a support which may, for example, be a spacecraft. A series of telescoping tubes are nested one within the other when the antenna is in a retracted stowed position. The outermost tube is rigidly attached to the support and the inner tubes are latched in the stowed position by a caging mechanism. The antenna is driven toward a deployed position by a dual motor driven cable which is terminated in a driving tube at the lower end of the innermost tube, from whence the cable is trained about pulleys at the tops and bottoms of successively large tubes of the antenna. The cable is wound on a drum at the lower end of the antenna and coaxial therewith. During deployment of the antenna, the drum rotates, thereby reeling in the deployment cable. The initial movement of the cable causes cam releasing of the latches in the caging device. Thereafter, the antenna tubes are extended until the final deployed position of the antenna is reached. A ratchet attached to the drum prevents reverse rotation of the drum and locks the antenna in the deployed position until the ratchet is released.
Official Gazette of the U.S. Patent and Trademark Office

N80-14184*# Acurex Corp., Mountain View, Calif.
GALILEO PROBE THERMAL PROTECTION: ENTRY HEATING ENVIRONMENTS AND SPALLATION EXPERIMENTS DESIGN Final Report
A. Balakrishnan, W. Nicolet, S. Sandhu, and J. Dodson Nov. 1979 133 p refs
(Contract NAS2-9909; Acurex Proj. 7396)
(NASA-CR-152334; FR-79-21/AS) Avail: NTIS HC A07/MF A01 CSCL 22B

A valid procedure was developed for predicting wall heating and ablation rates about the probe forebody. Entropy layer effects on convective heating rate were analyzed and the computed results are given. A feasibility study to perform an experiment, the selection of a candidate test facility, and the definition of a test matrix are described. The material selection, fabrication, and evaluation of the metal containing carbon-carbon composites for use on the Galileo probe are summarized. The effect of various Jovian atmospheric models on entry heating environment is considered as well as the effect of the nonspherical shape of the planet on entry trajectory. A.R.H.

N80-14185*# Thermacore, Inc., Leola, Pa.
METEOROID PROTECTION METHODS FOR SPACECRAFT RADIATORS USING HEAT PIPES Final Report
Donald M. Ernst Nov. 1979 99 p refs
(Contract JPL-955437)
(NASA-CR-162545) Avail: NTIS HC A05/MF A01 CSCL 22B

Various aspects of achieving a low mass heat pipe radiator for the nuclear electric propulsion spacecraft were studied. Specific emphasis was placed on a concept applicable to a closed Brayton cycle power sub-system. Three aspects of inter-related problems were examined: (1) the armor for meteoroid protection, (2) emissivity of the radiator surface, and (3) the heat pipe itself. The study revealed several alternatives for the achievement of the stated goal, but a final recommendation for the best design requires further investigation. R.E.S.

N80-14186# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE CURRENT STATUS OF PREDICTIONS OF LOW ENERGY PLASMA INTERACTIONS WITH SPACE SYSTEMS Air Force Surveys in Geophysics
Henry B. Garrett 4 Apr. 1979 38 p refs
(AD-A074523; AFGL-TR-79-0089; AFGL-AFSG-410) Avail: NTIS HC A03/MF A01 CSCL 22/1

The present status of low energy magnetospheric plasma interactions with space systems is reviewed. The role of predictions in meeting user needs in assessing the impact of such interactions is described. In light of the perceived needs of the user community and of the current status of modeling and prediction efforts, it is suggested that for most user needs more detailed statistical models of the low energy environment are required. In order to meet current prediction requirements, real-time in situ measurements are proposed as a near-term solution. GRA

N80-14187# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
GUIDELINES FOR SPACE MATERIALS SELECTION
Paris ESA Jul. 1979 120 p refs
(ESA-PSS-07/QRM-01-Issue-5) Avail: NTIS HC A06/MF A01

The different classes of materials used in spacecraft manufacture are reviewed, their chemical nature and physical aspects

are described, and processing and assembly methods are considered. Precautions to be taken and materials to be avoided are emphasized for each class. General effects of the space environment are also described. Some individual materials which are suitable for space application under certain conditions are mentioned. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also 07 Aircraft Propulsion, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N80-14188* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERCHARGED TOPPING ROCKET PROPELLANT FEED SYSTEM Patent
Warner L. Stewart, Ambrose Ginsburg, and Melvin J. Hartmann, inventors (to NASA) Issued 23 Oct. 1979 6 p Filed 21 Apr. 1966
(NASA-Case-XLE-02062-1; US-Patent-4,171,615; US-Patent-Appl-SN-545793; US-Patent-Class-60-203; US-Patent-Class-60-259) Avail: US Patent and Trademark Office CSCL 21H

A rocket propellant feed system utilizing a bleed turbopump to supercharge a topping turbopump is presented. The bleed turbopump is of a low pressure type to meet the cavitation requirements imposed by the propellant storage tanks. The topping turbopump is of a high pressure type and develops 60 to 70 percent of the pressure rise in the propellant.
Official Gazette of the U.S. Patent and Trademark Office

N80-14189*# Aerojet Liquid Rocket Co., Sacramento, Calif.
PERFORMANCE OF A TRANSPIRATION-REGENERATIVE COOLED ROCKET THRUST CHAMBER Final Report
H. W. Valler Sep. 1979 414 p refs
(Contract NAS3-21029)
(NASA-CR-159742) Avail: NTIS HC A18/MF A01 CSCL 21H

The analysis, design, fabrication, and testing of a liquid rocket engine thrust chamber which is gas transpiration cooled in the high heat flux convergent portion of the chamber and water jacket cooled (simulated regenerative) in the barrel and divergent sections of the chamber are described. The engine burns LOX-hydrogen propellants at a chamber pressure of 600 psia. Various transpiration coolant flow rates were tested with resultant local hot gas wall temperatures in the 800 F to 1400 F range. The feasibility of transpiration cooling with hydrogen and helium, and the use of photo-etched copper platelets for heat transfer and coolant metering was successfully demonstrated. A.R.H.

N80-14190# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
ASSESSMENT OF IN SITU DIAGNOSTICS FOR APPLICATION TO ROCKET PROPULSION PROBLEMS Final Report, Feb. 1977 - Mar. 1978
W. K. McGregor Jun. 1979 155 p refs
(AF Proj. 2308)
(AD-A073520; AFRPL-TR-78-62) Avail: NTIS HC A08/MF A01 CSCL 21/2

A compelling need for knowledge of the properties (temperature, density, velocity, composition, etc.) of the flows produced by propulsion systems has recently surfaced in many areas. Of specific interest to the Air Force Rocket Propulsion Laboratory (AFRPL) is knowledge of properties within combustion chambers, particularly for solid fueled motors employing metallized propellants, and properties affecting exhaust plume observables (e.g., smoke, infrared radiation signatures, ultra-violet radiation signatures, radar cross sections, etc.). Methods of making measurements within combustion flows must avoid influencing the very phenomena to be measured and, generally, must be made from without (nonintrusive) because of the harsh environment. This report is aimed at defining the needs for 'combustion diagnostics' associated with rocket propulsion, assessing the status and utility of the applicable techniques, and establishing a basis for the research and development required to provide techniques to meet the defined needs. GRA

N80-14191# Block Engineering, Inc., Cambridge, Mass.
THE 0.1 WAVENUMBER SPECTRAL MEASUREMENTS IN THE REGION FROM 2050 - 2410 WAVENUMBERS OF A STATIC, EXPERIMENTAL ROCKET MOTOR AT THREE PRESSURE ALTITUDES Final Report, Sep. - Nov. 1978
Merle J. Persky 21 Dec. 1978 177 p refs
(Contract N60530-78-C-0272)
(AD-A073704; BEI-78-761) Avail: NTIS HC A09/MF A01 CSCL 17/5

Development of military infrared systems dictates a need for high resolution, infrared spectral data on exhaust plume radiation as a function of altitude and spatial position. To satisfy this need, high resolution spectral measurements were performed on a small, experimental rocket motor. GRA

N80-14192# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
AN ANALYSIS OF EXTERNAL BURNING PROPULSION Final Technical Report, Nov. 1977 - Nov. 1978
D. W. Harvey Mar. 1979 83 p refs
(Contract F04611-78-C-0002; AF Proj. 5730)
(AD-A074639; MDC-G8090; AFRPL-TR-79-8) Avail: NTIS HC A05/MF A01 CSCL 21/2

A computer model of external burning propulsion of axisymmetric, supersonic vehicles is described. Reactive gaseous injectant issues from individual nozzles around the vehicle periphery near the base. At the base, these individual jets merge into an annulus of injectant surrounding the base cavity. Detailed individual-jet calculations in the region upstream of the base are made by an existing analysis developed for fuel-rich jet interaction. The injectant annulus is calculated assuming an adjustable fraction of the flow at equilibrium and the remainder frozen; mass and momentum are conserved, and the transverse pressure gradients are assumed negligible. Results and trends are presented for parameters including Mach number, altitude, vehicle geometry and injectant mass and momentum flux and composition. GRA

N80-14193# ARO, Inc., Arnold Air Force Station, Tenn.
BIPROPELLANT ENGINE PLUME CONTAMINATION PROGRAM. VOLUME 3: PERFORMANCE PREDICTIONS FOR THE AJ10-181 BI-PROPELLANT ROCKET ENGINE USING THE CONTAM/TCC CODE Final Report, Oct. 1977 - Sep. 1978
M. Kinslow and W. B. Stephenson AEDC Sep. 1979 112 p refs
(AD-A074914; AEDC-TR-79-28-Vol-3) Avail: NTIS HC A06/MF A01 CSCL 21/9

A plume contamination test conducted in the AEDC Aerospace Chamber (10V) with the Aerojet AJ10-181 5-lb thrust bipropellant engine provided data for comparison with the CONTAM computer program. The Plume Contamination Effects Prediction Program (CONTAM), developed by McDonnell Douglas under Air Force Rocket Propulsion Laboratory (AFRPL) sponsorship, comprises several component codes which describe the gas dynamics and chemistry. GRA

N80-14194# ARO, Inc., Arnold Air Force Station, Tenn.
CONTAMINATION MEASUREMENTS FROM A 5 LB SUB

F THRUST BIPROPELLANT ENGINE, PHASE 2 Final Report
R. E. Alt, H. M. Powell, L. L. Price, D. F. Frazine, and W. B. Stephenson AEDC 22 Jan. 1979 52 p refs
(AD-A073871; AEDC-TSR-79-V4) Avail: NTIS HC A04/MF A01 CSCL 21/9

A Bipropellant Rocket Engine plume contamination test program was conducted in the Aerospace Chamber (10V) between Sept. 25 and Oct. 20, 1978. During the four week test period a 5 lb sub F thrust rocket engine was fired over a range of engine operating parameters in a cryogenically pumped vacuum chamber where the background pressure was maintained below 1 x .0000001 torr. A vidicon image intensifier coupled spectrometer (VICS) system was used in conjunction with an electron beam to make number density and rotational temperature measurements of gas species (N2, CO, CO2, and H2/H2O) in the forward flow region of the rocket nozzle. A photomultiplier tube was used in place of the vidicon to make number density and temperature measurements of N2 in the plume backflow region. Forward flow laser light scattering measurements were made with the VICS system to characterize the particle size and particle number distributions in the plume core. Mass flux measurements were made in the plume backflow region (60 degrees-135 degrees off axis) with cryogenically cooled quartz crystal microbalances (QCM's). GRA

N80-14195# Office National d'Etudes et de Recherches Aerospatiales, Leclerc (France). Directeur de l'Energetique.
PERFORMANCE TESTS OF LINEAR ARRAYS OF NEEDLE POINTS AS PART OF A STUDY ON FIELD EFFECT CESIUM ENGINES [ESSAIS DE FONCTIONNEMENT DE RESEAUX LINEARES A FILS AFFUTES POUR LA CONDUITE D'ETUDES DE PROPULSEURS A EMISSION DE CHAMP AU CESIUM]
Jean Labbe and Joel Guernigou 30 Dec. 1976 158 p refs In FRENCH
(Contract ESTEC-2117/73-AK)
(ONERA-RTS-1/3127-EY; ESA-CR(P)-1240) Avail: NTIS HC A08/MF A01

Tests to characterize the operation of cesium ion emitters, based on a field effect phenomenon are described. Twenty devices, consisting of linear arrays of fine pointed rods and different operating modes and geometries were tested. Results show the flux of nonlinear atoms, diffusing past an optical sensor, is approximately 5% and that a relatively high current (0.9 mA/cm) is generated under conditions of good stability. The essential factor for determining whether or not a dense and homogeneous ionic flux is obtainable is the coefficient of diffusion for the liquid cesium on the ends of the points in the arrays.
Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N80-14196*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BURNING CHARACTERISTICS AND FIBER RETENTION OF GRAPHITE/RESIN MATRIX COMPOSITES
Kenneth J. Bowles 8 Feb. 1980 14 p refs Proposed for Presentation at the 35th Ann. Conf. of the Reinforced Plastics/Composites Inst., New Orleans, 4-8 Feb. 1980; sponsored by Soc. of Plastics Ind.
(NASA-TM-79314; E-271) Avail: NTIS HC A02/MF A01 CSCL 11D

Graphite fiber reinforced resin matrix composites were subjected to controlled burning conditions to determine their burning characteristics and fiber retention properties. Small samples were burned with a natural gas fired torch to study the effects of fiber orientation and structural flaws such as holes and slits that were machined into the laminates. Larger laminate samples were burned in a modified heat release rate calorimeter. Unidirectional epoxy/graphite and polyimide/graphite composites and boron powder filled samples of each of the two composite systems were burn tested. The composites were exposed to a thermal radiation of 5.3 Btu/sq ft-sec in air. Samples of each of the unfilled composite were decomposed anaerobically in the calorimeter. Weight loss data were recorded for burning and decomposition times up to thirty-five minutes. The effects of fiber orientation, flaws, and boron filler additives to the resins were evaluated. A high char forming polyimide resin was no more effective in retaining graphite fibers than a low char forming epoxy resin when burned in air. Boron powder additions to both the polyimide and the epoxy resins stabilized the chars and effectively controlled the fiber release. A.R.H.

N80-14197*# General Dynamics/Convair, San Diego, Calif.
THERMOPHYSICAL PROPERTIES DATA ON GRAPHITE/POLYIMIDE COMPOSITE MATERIALS Final Report
M. D. Campbell and D. D. Burleigh Nov. 1979 69 p
(Contract NAS1-15103)
(NASA-CR-159164; GDC-NAS-79-002) Avail: NTIS HC A04/MF A01 CSCL 11D

Experimental data for the thermal conductivity, thermal expansion, specific heat, and emittance of laminates of HTS/NR 15082 and HTS/PMR 15 are presented. Measurements were made over the temperature range 116 K to 588 K. Results for the two materials were similar with some differences attributable to laminate quality. Higher expansion coefficients for the HTS/PMR 15 specimens in the resin-dominated directions indicate a higher coefficient for PMR 15 than NR 15082. Author

N80-14198# Virginia Univ., Charlottesville. Dept. of Materials Science.
MICROSTRUCTURAL INVESTIGATION OF POLYCRYSTALLINE IRON WHISKERS Technical Report, 1 Feb. 1975 - 31 Jan. 1976
D. S. Lashmore, W. A. Jesser, D. M. Schladitz, H. J. Schladitz, and H. G. F. Wilsdorf Dec. 1976 18 p refs
(Contract N00014-75-C-0691)
(AD-A074708; UVA/525321/MS76/101) Avail: NTIS HC A02/MF A01 CSCL 20/8

The microstructure of polycrystalline iron whiskers produced by chemical vapor decomposition in a magnetic field is found to consist of a core extending the length of the whiskers surrounded by a series of approximately cylindrical layers made up of particles whose diameters are about 1000 angstroms to 3000 angstroms. The grain size in both the core and the surrounding particles is found to be between 50 angstroms to 200 angstroms. The very high strength of these whiskers, 800 MPa, is considered a result of extreme grain refinement strengthening. GRA

N80-14199# Avco Systems Div., Wilmington, Mass.
PROTECTIVE COATINGS FOR AIRCRAFT COMPOSITES IN NUCLEAR ENVIRONMENTS Final Report, 1 Jan. - 30 Nov. 1977
J. G. Alexander and P. J. Grady 1 Apr. 1978 168 p refs
(Contract DNA001-77-C-0098)
(AD-A074889; AD-E300594; AVSD-0082-78-RR; DNA-4735F) Avail: NTIS HC A08/MF A01 CSCL 11/3

This program selected and experimentally evaluated several classes of protective coatings for nuclear flash for application on graphite epoxy and quartz polyimide composite aircraft skins. An analytical/experimental assessment was also performed to demonstrate the increased tensile capability of the two composite materials with the application of selected coatings. GRA

N80-14200# Ames Lab., Iowa.
GRAPHITE MORPHOLOGIES IN THE SOLIDIFICATION OF HIGH PURITY Fe-C-Si ALLOYS
B. Dhindaw and J. D. Verhoeven May 1979 50 p refs

(Contract W-7405-eng-82)
(IS-4693) Avail: NTIS HC A03/MF A01

Alloys of Fe-C-Si prepared from high purity metals were solidified in crucibles and by directional freezing techniques. It was found that the formation of graphite nodules required cooling rates in the 100 C to 200 C/min range. At very high rates no graphite formed and at low rates coral graphite formed. The use of very high purity Battelle Iron eliminated nodule formation unless an inoculant was used. Extensive chemical analyses were not able to detect the elements effective as nucleating agents, except to show that if an individual element were responsible it was effective at concentrations in the low ppM range. Possible mechanisms are proposed to account for the observed results.
DOE

N80-14201# Toulouse Univ. (France). Lab. de Genie Electrique.
STUDY OF THE TRANSFORMATION OF SYNTHETIC AND POLYPROPYLENE FIBERS UNDERGOING ELECTRICAL DISCHARGES AT HIGH PRESSURE [ETUDE LA TRANSFORMATION DE FIBRES SYNTHETIQUES, DU POLYPROPYLENE PAR L'ACTION DE DECHARGES ELECTRIQUES A HAUTE PRESSION]
C. Antonio and J. Sarlaboux Sep. 1978 27 p In FRENCH
Presented at Conv. de Rech. Action de l'Effluve sur les Surfaces, 1979
(Publ-369) Avail: NTIS HC A03/MF A01

The physical and chemical transformation of polyester fibers and polypropylene films subjected to a corona type discharge treatment was studied. The adsorption isotherms were obtained by inverse chromatography, and the specific surfaces were determined by the gas adsorption technique. The polyester (polyethylene terephtalate) initially shows a decrease in the adsorption capacity, and for longer treatments a progressive increase. The initial decrease appears to be associated with the hydrogen bonds. The polypropylene film shows a consistent reduction in electric rigidity with treatment time and large degradation effects at the electron microscope when treated in an oxydizing atmosphere. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 *Thermodynamics and Statistical Physics*.

N80-14202 Wisconsin Univ. - Madison.
THE GENERALIZED PHASE SHIFT APPROACH TO ROTATIONAL EXCITATION IN DILUTE DIATOMIC GASES Ph.D. Thesis
Kevin Richard Squire 1979 307 p
Avail: Univ. Microfilms Order No. 7921581

The molecular collision series of Curtiss is reviewed. The close-coupled scattering equations are derived and are rewritten in several angular momentum bases. The generalized phase shift (GPS) equations and their relation to the closecoupled equations are described. An operator solution of the GPS equations is developed which takes the form of a double series in powers of h and the anisotropic part of the intermolecular potential. Explicit expressions are given for operators sufficient to obtain a classical limit solution valid to third order in the potential anisotropy.
Dissert. Abstr.

N80-14203 Washington Univ., Seattle.
VIBRATIONAL SPECTRA OF SOLID ETHANE; VIBRATIONAL SPECTRA OF DIBORANE IN AN ARGON MATRIX Ph.D. Thesis
Mark George Wisnosky 1979 257 p
Avail: Univ. Microfilms Order No. 7927890

The infrared and Raman spectra of polycrystalline ethane in the solid 2 phase, prepared at approximately 20 K, are presented and interpreted in terms of the crystal structures reported by van Nes and Vos. The spectra are found to be in complete agreement with the proposed monoclinic structure P2 sub 1/n, z = 2. A normal coordinate analysis of solid 2 ethane coordinates is also given. The infrared spectra of diborane, frozen in an argon matrix, are also presented. B2H6, B2D6 and partially deuterated diborane are all included. These spectra, along with gas phase Raman spectra obtained from the literature, are used in a force field calculation. A calculation of the force field for diborane by Biom and Muller was used as the starting point. Only minor variations from the results of Biom and Muller were required. Dissert. Abstr.

N80-14204 Utah Univ., Salt Lake City.
CATALYTIC SYNTHESIS OF LIGHT HYDROCARBONS FROM CARBON MONOXIDE/HYDROGEN OVER METAL CATALYSTS Ph.D. Thesis
Chen-hsyong Yang 1979 132 p
Avail: Univ. Microfilms Order No. 7927071

The synthesis of low molecular weight hydrocarbons from CO and H2 mixture over metal catalysts was studied. The catalysts evaluated were prepared by co-precipitation and impregnation techniques. The catalytic activities and selectivities were determined in a bench scale fixed-bed reactor. Iron catalysts appeared to have the most potential for synthesis of C2-C4 hydrocarbons. Reduced-and-nitrided iron catalysts were very active and gave better selectivity toward C2-C4 olefinic hydrocarbons than Co-C4 catalysts. Potassium was an effective promoter to increase activity but had no effect on hydrocarbon selectivity. The amount of potassium required for maximum activity was different for each iron catalyst system. Manganese was the most effective promoter. Dissert. Abstr.

N80-14205 Purdue Univ., Lafayette, Ind.
COMPUTER CONTROLLED INTERNAL REFLECTION SPECTROELECTROCHEMICAL MEASUREMENTS OF FAST ELECTRON TRANSFER REACTIONS Ph.D. Thesis
John Charles Holland 1979 199 p
Avail: Univ. Microfilms Order No. 7926386

Studies of absorbance-time transients at platinum optically transparent electrodes (OTE) were undertaken to directly monitor concentration profiles using internal reflection spectroelectrochemistry (IRS). A laboratory computer performing real time data acquisition, signal averaging, rapid implicit digital simulation and curve fitting contributed to improved speed and accuracy. Also coulostatic charge injection, rugged Pt OTE, a stable, intense light source, and a vacuum compatible cell with adjustable reference electrode was combined to produce highly accurate IRS absorbance-time profiles for semi-infinite linear diffusion. Experimental profiles for di-p-anisylamine and tri-p-anisylamine oxidation were found to agree simultaneously with established optical, electrochemical, and diffusion theories. Dissert. Abstr.

N80-14206 Wisconsin Univ. - Madison.
SPECTROSCOPIC INVESTIGATIONS OF CATHODE ELECTRODE VAPOR EXCITATION AND PROPAGATION IN HIGH VOLTAGE SPARK DISCHARGES Ph.D. Thesis
Robert John Klueppel 1979 412 p
Avail: Univ. Microfilms Order No. 7919803

Observations of the spark at high repetition rates (kHz range) reveal the process to consist of two physically distinct events: one is the formation of an initial filamentary structure bridging the electrodes and expanding outward in time to produce a torus, the other is a sheath of accumulated, toroidally-shaped material from the previous discharges in the high frequency train coaxially enveloping this expanding filament. The instrumental systems used to effect stroboscopic detection from positionally-stabilized discharges with temporal and spatial resolutions of 0.1 microseconds and 0.05 mm for the emission, absorption, and Schlieren experiments are detailed. Methods used for stabilizing, generating and activating discharge trains at high frequency are described as well as the optical, mechanical, and electronic coupling of the apparatus. Dissert. Abstr.

N80-14207 Texas Univ. at Austin.
AN ELECTRON DIFFRACTION STUDY OF LASER EXCITED SULFUR HEXAFLUORIDE Ph.D. Thesis
Marsha Ann Multer Arvedson 1979 87 p
Avail: Univ. Microfilms Order No. 7928257

Gas-phase electron diffraction is applied to the study of molecules subjected to infrared laser radiation. A rise in the vibrational amplitudes of the interatomic distances in SF6 due to direct absorption of laser radiation was detected. The relative size of the increase in the mean amplitudes was inconsistent with a thermal distribution of absorbed energy. For the power densities used in this experiment, redistribution of energy from the pumped mode to other vibrational modes in the molecule is estimated to take longer than a microsecond. A scattering theory is derived and applied in the analysis of the data from the above experiment. The theoretical scattered intensity is corrected for the effects of intramolecular multiple scattering.
Dissert. Abstr.

N80-14208 Northwestern Univ., Evanston, Ill.
HYDROGENATION CATALYSTS DERIVED FROM Mo(CO)6/ALUMINA Ph.D. Thesis
Robert Glade Bowman 1979 270 p
Avail: Univ. Microfilms Order No. 7927303

A variety of catalysts were prepared by decomposing molybdenum hexacarbonyl on gamma-alumina. The catalytic characteristics of these materials were influenced by the activation temperature, the degree of hydroxylation of the alumina, and the carrier gas used in the activation. The stoichiometry of the catalysts formed was determined by measuring the gases evolved during activation. Various catalysts derived from Mo(CO)6/alumina catalyzed metathesis of olefins, hydrogenation of olefins, methanation of carbon monoxide, and hydrogenolysis of cyclopropane.
Dissert. Abstr.

N80-14209 Wisconsin Univ. - Madison.
HYDRODYNAMIC AND ELECTROSTATIC CHARACTERIZATION OF PARTICLES BY LIGHT SCATTERING Ph.D. Thesis
George Barrett Cafiach 1979 127 p
Avail: Univ. Microfilms Order No. 7921548

The use of light scattering for characterization of synthetic and biological particles is described, including elastic, quasi-elastic and electrophoretic techniques. Three distinct systems are investigated: bovine serum albumin, an amphoteric polymer latex, and the bovine retinal photoreceptor disk membrane. The electrophoretic mobility of bovine serum albumin measured by electrophoretic light scattering is found to vary with ionic strength according to Henry's law. A pH dependent variation in radius of the amphoteric latex is discussed in terms of a concentric sphere model where the outer shell consists of hydrophilic moieties and the inner core of hydrophobic polystyrene. Binding of Ca(2+) on bovine rod outer segment membrane vesicles is deduced from electrophoresis. There appears to be two types of binding sites, one of higher affinity with second order cooperativity, and another of lower affinity with no cooperativity.
Dissert. Abstr.

N80-14210 Northwestern Univ., Evanston, Ill.
A MINICOMPUTER SYSTEM FOR CHEMICAL EXPERIMENTATION, WITH APPLICATIONS TO ELECTROCHEMILUMINESCENCE AND CYCLIC DIFFERENTIAL PULSE VOLTAMMETRY Ph.D. Thesis
Kenneth Franklin Drake 1979 489 p
Avail: Univ. Microfilms Order No. 7927328

The minicomputer-based instrumental system presented is designed to perform the triple-step ECL (electrochemiluminescence) experiment with step times sufficiently short so that the kinetics of the homegeneous electron-transfer process can be investigated. Since the mass-transport and chemical kinetics are not subject to an analytical solution, a finite-difference program was written to simulate the experiment assuming various values of the homogeneous electron-transfer rate. ECL studies were performed on 9,10-diphenylanthracene and tris-(2,2'-bipyridine) ruthenium(II) perchlorate, but very unstable data were obtained, making a determination of the rate constant impossible. Definite perannihilation characteristics were observed. A combination of instrumental and chemical complications is suspected.
Dissert. Abstr.

N80-14211*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
METHODS FOR CALCULATION OF ENGINEERING PARAMETERS FOR GAS SEPARATION
D. D. Lawson 1 Oct. 1979 25 p refs Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-162532; JPL-PUB-79-46) Avail: NTIS HC A02/MF A01 CSCL 07D

A group additivity method is generated which allows estimation, from the structural formulas alone, of the energy of vaporization and the molar volume at 25 C of many nonpolar organic liquids. Using these two parameters and appropriate thermodynamic relations, the vapor pressure of the liquid phase and the solubility of various gases in nonpolar organic liquids are predicted. It is also possible to use the data to evaluate organic and some inorganic liquids for use in gas separation stages or liquids as heat exchange fluids in prospective thermochemical cycles for hydrogen production.
K.L.

N80-14212*# Engineering Information Systems, Inc., San Jose, Calif.
SPAR THERMAL ANALYSIS PROCESSORS REFERENCE MANUAL, SYSTEM LEVEL 16. VOLUME 1: PROGRAM EXECUTION
M. B. Marlowe, R. A. Moore, and W. D. Whetstone Oct. 1979 262 p
(Contract NAS1-14464)
(NASA-CR-159162; EISI-TR-4007-2-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 07D

User instructions are given for performing linear and nonlinear steady state and transient thermal analyses with SPAR thermal analysis processors TGEO, SSTA, and TRTA. It is assumed that the user is familiar with basic SPAR operations and basic heat transfer theory.
J.M.S.

N80-14213# SRI International Corp., Menlo Park, Calif.
LASER FLUORESCENCE STUDIES OF CHEMILUMINESCENT CHEMICAL REACTIONS Final Report, Jun. 1975 - Jul. 1979
Graham Black 27 Jul. 1979 72 p refs
(Contract F44620-75-C-0083; AF Proj. 2301)
(AD-A073829; SRI-MP-79-54; AFOSR-79-0951TR) Avail: NTIS HC A04/MF A01 CSCL 20/10

Photodissociation of N2O (to produce O(1S)) and OCS (to produce S(1S)) has been studied in liquid argon and nitrogen. Emission spectra and lifetime information have been obtained. Synchrotron radiation has been used to produce XeF (B, C, and D) states from XeF2. Quantum yields, radiative lifetimes, and collisional rate coefficients with Ne, Ar, and N2 were determined.
GRA

N80-14214# Woods Hole Oceanographic Institution, Mass.
VOLATILE ORGANIC COMPOUNDS IN SEAWATER Ph.D. Thesis
Philip M. Gschwend Sep. 1979 277 p refs
(Contract N00014-74-C-0262; Grants NOAA-04-7-158-44104; NOAA-04-8-M01-149; NSF OCE-22781)
(AD-A074179; WHOI-79-72) Avail: NTIS HC A13/MF A01 CSCL 07/3

Vapor phase stripping and solid adsorbent trapping were applied to seawater and related samples to concentrate volatile organic compounds. The concentrates were subsequently analyzed by glass capillary gas chromatography and combined gas chromatography-mass spectrometry. The compound identifies and the spatial and temporal distributions of their concentrations were used to determine some sources, transformations, and transport mechanisms of organic matter in the sea. Volatile organic compounds were determined in seawater samples from the Sargasso Sea, the western Equatorial Atlantic, and the upwelling region off Peru. Pentadecane was present in all three areas in surface samples of 10-40 ng/kg and decreased to 1-2 ng/kg in the deep water. A source related to the transformation of the algal fatty acid, hexadecanoic acid, by zooplankton is proposed since anthropogenic and direct phytoplankton sources are unlikely. C2-alkylated benzenes were found in the upwelled water off Peru at about 4 ng/kg in the surface (5 and 20m), 3 ng/kg below the thermocline (100m), and 2 ng/kg or less in deeper water. A surface or atmospheric source is required to produce this distribution. C8-C10 aldehydes were also found in seawater from off Peru. The direct correlation of their concentrations with chlorophyll A and with oxygen indicated that they

are derived from chemical oxidation of algal metabolites, for example, unsaturated fatty acids. Total volatiles in the oligotrophic Sargasso Sea were about 10-30 ng/kg while the biologically productive upwelling region off Peru contained up to 100 ng/kg. GRA

N80-14215# Ballistic Research Labs., Aberdeen Proving Ground, Md.

ELECTRON SPIN RESONANCE STUDIES OF HYDROGEN AND DEUTERIUM BOMBARDMENT OF UNSATURATED HYDROCARBONS AT 77K

Cornelius U. Morgan and Kevin J. White Jul. 1979 30 p refs

(DA Proj. 1L1-61102-AH-60)

(AD-A074264; AD-E430296; ARBRL-TR-02178) Avail: NTIS HC A03/MF A01 CSCL 07/3

The interaction of free atoms and radicals with unsaturated compounds has been a field of considerable interest. In this present work, the reactions of solid unsaturated hydrocarbons at 77K with gaseous hydrogen atoms are studied by electron spin resonance (esr). The hydrogen atom adds directly to the terminal position of the double bond of trans-2-butene, 2,3-dimethyl-1, 3-butadiene, 2-methyl-1-butene-3-yne, 3,3-dimethyl-1-butene, isobutylene, ethylene, and propylene to produce the sec-butyl, 2,3-dimethyl-2-butenyl, 1,1-dimethyl-2-propynyl, 1,2,2-trimethyl propyl, t-butyl, ethyl, and isopropyl radicals, respectively. The addition reaction of H atoms to trans-1,3-pentadiene occurs at the terminal carbon atom of the terminal double bond to produce the 1-methyl-2-butenyl radical. Confirmation of an addition reaction was made by bombarding the unsaturate first with hydrogen and then with deuterium. The two radicals can be distinguished by their esr spectra. On bombardment of allene with H atoms the allenyl radical was observed. This radical was produced by an abstraction of a hydrogen atom from allene. GRA

N80-14216# Washington Univ., Seattle. Lab. for Chemometrics.

PSEUDOPOLAROGRAPHIC DETERMINATION OF METAL COMPLEX STABILITY CONSTANTS IN DILUTE SOLUTION BY RAPID SCAN ANODIC STRIPPING VOLTAMMETRY Interim Report

Steven D. Brown and Bruce R. Kowalski Sep. 1979 37 p refs

(Contract N00014-75-C-0536)

(AD-A074806; Rept-16) Avail: NTIS HC A03/MF A01 CSCL 07/4

By using a computer controlled anodic stripping voltamater with automatic background correction, pseudopolarograms can be obtained by plotting the peak area vs. the deposition potential for a series of stripping voltametric runs. With ASV as a method of amplification, the ligand number and stability constants are determined for metal complexes at concentration ranges expected of natural water systems. GRA

N80-14217# Callery Chemical Co., Pa.

CARBORANE SYNTHESIS Final Report, Oct. 1978 - Jun. 1979

28 Aug. 1979 22 p refs

(Contract DASG60-78-C-0146)

(AD-A074570; CCC-79-126) Avail: NTIS HC A02/MF A01 CSCL 07/3

This report describes Phase 1 work done in thermolysis of tetraethylammonium borohydride (1-), (Et4NBH4) to tetraethylammonium decahydrodecaborate(2(-)), ((Et4N)2B10H10). The objective of this Phase 1 program was to solve the heat transfer requirements occurring during thermolysis. The nature of this requirement was to identify and optimize the reaction conditions of scale-up using boron and non-boron based solvents in the conversion of Et4NBH4 by thermolysis to (Et4N)2B10H10. The critical steps in this requirement were to dissipate exothermic heat to minimize the (Et4N)2B12H12 by-product formation and to maximize the desired (Et4N)2B10H10 product. Thermolysis of Et4NBH4, using triethylamine borane (Et3NBH3) as a boron-based solvent was demonstrated on a 50 g scale with (Et4N)2B10H10 yields up to 60%. Thermolysis of Et4NBH4 using mineral oil as the non-boron based solvent, demonstrated 47% yields. GRA

N80-14218# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.

MEASUREMENT OF THE RADIATIVE PROPERTIES OF AIR AT HIGH TEMPERATURES AND PRESSURES Final Report, Jun. 1977 - May 1979

A. Larson, R. T. Murray, D. Dodson, T. Salmon, and W. Christy Arnold Air Force Station, Tenn. AEDC Oct. 1979 42 p refs

(Contract F40600-77-C-0007)

(AD-A074825; AEDC-TR-79-67) Avail: NTIS HC A03/MF A01 CSCL 07/4

Steady air columns near 10,000 K and at pressures from 1 to 30 atm were studied spectroscopically from the side in emission and absorption experiments. Argon columns were used in auxiliary experiments. At 30 atm the effects of self-absorption within the air arc were treated along with corrections for absorption by the oxides of nitrogen in the environment surrounding the arc. Temperature profiles deduced from Abel-inverted emission data on the OI 844.6 nm and the NI 862.9 nm lines and corrected for the absorption effects are in excellent agreement. Laser transmission experiments at 632.8 nm show that ray refraction in the arc and its boundaries warrants attention at 30 atm in experiments in which intensities are being measured. A number of observations relating to work at still higher pressures were made. GRA

N80-14219# Colorado State Univ., Fort Collins. Dept. of Chemistry.

TWO PHOTON SPECTROSCOPY OF PYRAZINE AND TRIAZINE

J. D. Webb, K. M. Swift, and E. M. Bernstein Sep. 1979 10 p refs Submitted for publication

(Contract N00014-75-C-1179; NR Proj. 056-607)

(AD-A074055; TR-22) Avail: NTIS HC A02/MF A01 CSCL 07/4

Two photon absorption spectra, detected by fluorescence, phosphorescence, and photoacoustic methods are presented for pyrazine and triazine. Vibronic assignments are made in both systems based on polarization and contour analysis. For pyrazine, origin intensity is observed which suggests the (B)(3)U) state does not possess inversion symmetry. Linear, quadratic, and pseudo-Jahn Teller couplings are discussed for triazine. GRA

N80-14220# Rhode Island Univ., Kingston. Dept. of Ocean Engineering.

RAMAN AND INFRARED SPECTROSCOPY OF AQUEOUS CORROSION FILMS ON LEAD IN 0.1 M SULFATE SOLUTIONS

R. Thibeau, A. Goldfarb, C. Brown, and R. Heidersbach Sep. 1979 37 p refs

(Contract N00014-76-C-0889)

(AD-A074567; TR-7) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report contains the manuscript of a paper submitted for publication in the Journal of the Electrochemical Society. The Pb-H2O-SO4 Pourbaix diagram was investigated by examining potentiostatically oxidized lead samples using Raman and infrared spectroscopy. In 0.1 M sulfate solutions, surface film compositions were not in complete agreement with predictions of the calculated potential -pH diagram. The Pourbaix diagram did not predict the formation of PbO under any conditions; however, spectra indicated the presence of the oxide at certain potentials in acid and neutral solutions and at all potentials above the immunity region in basic solutions. Spectroscopic identification of insoluble surface species was in agreement with potentiodynamic polarization curves. GRA

N80-14221# IBM Watson Research Center, Yorktown Heights, N.Y.

PHOTOEMISSION STUDIES OF TIME-RESOLVED SURFACE REACTIONS: ISOTHERMAL DESORPTION OF CO FROM Ni(3)

G. W. Rubloff 27 Feb. 1979 20 p refs Presented at the 2d European Conf. on Surface Science, Cambridge, England, 26-29 Mar. 1979

(Contract N00014-77-C-0366)

(AD-A074953; TR-6) Avail: NTIS HC A02/MF A01 CSCL 07/4

A new dynamic approach to spectroscopic studies of surface

reactions is described. A fast-acting UHV gas dosing system is employed to prepare the adsorbed species in an initial chemisorption state under reaction conditions of elevated temperature and/or pressure (to approximately 1 torr). Individual reaction steps are then resolved in time using photoemission spectroscopy to probe the surface electronic structure, yielding information about the kinetics of individual reaction steps, the nature of chemisorbed species, and the surface reaction path. As a result application of this approach, the kinetics of isothermal desorption of CO from Ni(111) is studied for temperatures up to approximately 230 C. The coverage-dependence of the rate constants is revealed directly in the shape of each desorption curve. Preexponential (frequency) factors as well as desorption activation energies show significant variation with coverage. GRA

N80-14222# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
THE KINETICS AND SPECTROSCOPY OF AIRCRAFT AND ROCKET PLUME CONSTITUENTS Interim Scientific Report, 1 Jun. 1978 - 31 May 1979
F. P. Tully and A. R. Ravishankara 31 Jul. 1979 24 p refs
(Contract F49620-77-C-0111; AF Proj. 2308)
(AD-A074220; AFOSR-79-0969TR; ISR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

Utilizing the technique of flash photolysis-resonance fluorescence, the rate constants for the reactions of hydroxyl radicals (OH) with hydrogen, methane, carbon monoxide and ethane were measured at elevated temperatures as high as 1020 K. Distinct curvature was observed in the Arrhenius plots for all four reactions. The measured rate constants were compared with previous measurements in the literature. Future measurement plans were outlined. GRA

N80-14223# Battelle Pacific Northwest Labs., Richland, Wash.
EVALUATION OF POTENTIAL CHEMICAL/MECHANICAL DEGRADATION PROCESSES AFFECTING FUEL AND STRUCTURAL MATERIALS UNDER LONG-TERM WATER STORAGE
G. E. Zima May 1979 47 p refs
(Contract EY-76-Y-06-1830)
(NUREG-CR-0668; PNL-2379) Avail: NTIS HC A03/MF A01

A review is made of spent fuel leaching under the storage pool environment. A simple leaching significance index is proposed which, in addition to the leaching characteristics of selected radionuclides, is also sensitive to two important pool cleanup system parameters, namely the decontamination factor and the turn-around rate. Using recent spent fuel leaching data, indices are calculated for several radionuclides of interest and they indicate that, under quite conservative assumptions, leaching should pose no problem to the ISFSI system. DOE

N80-14224# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
SUBSTRUCTURE AND PROPERTIES OF SODIUM BETA ALUMINA SOLID ELECTROLYTES Final Report
L. C. DeJonghe May 1979 135 p refs Sponsored by Electric Power Research Inst., Palo Alto, Calif.
(EPRI-FP-1058) Avail: NTIS HC A07/MF A01

A study was conducted to determine the relationship between the impurities and microstructure and the properties of sodium beta alumina solid electrolytes. An investigation is presented of certain aspects of the electrolyte fabrication, since the sintering process by which the electrolyte is made determines, to a large extent, the microstructure and impurity distribution. The methods used included high-resolution transmission electron microscopy and measurement of the response of the electrolyte to ac signals between 10 hertz and 10 megahertz (complex admittance). Specifically, the importance of transient liquids during the sintering process was clarified. The effects on ionic conductivity of the presence of silicon (as silicates), calcium (as calcium aluminates), and zinc (in solid solution) were quantified. The importance of the microstructure and, in particular, the role of the grain boundaries in the sodium ion conduction process were elucidated. DOE

N80-14225# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
ULTRAVIOLET SPECTROSCOPY OF NITROUS OXIDE (N2O): A TEMPERATURE-RESOLVED STUDY Ph.D. Thesis
G. S. Selwyn Mar. 1979 239 p refs
(Contract W-7405-eng-48)
(LBL-8739) Avail: NTIS HC A11/MF A01

The absorption spectra of nitrous oxide and its N-15 isotopes were studied from 172 to 330 nm. The long wavelength absorption above 265 nm is almost entirely due to Rayleigh scattering. This reduces the calculated rate of nitrous oxide photolysis in the troposphere to a very small value. The temperature dependence of the absorption from 173 to 240 nm was measured for use in atmospheric modeling of the photolysis of nitrous oxide. Spectra over the wavelength range 172 to 190 nm demonstrate that the diffuse bands are a separate pronounced absorption of nitrous oxide which is strongly affected by temperature. This banding is the result of transitions to discrete vibronic levels in an upper electronic state. DOE

N80-14226# California Univ., Berkeley. Lawrence Berkeley Lab.
BASIC ENERGY PROPERTIES OF ELECTROLYTIC SOLUTIONS DATABASE
Sidney L. Phillips, H. Ozbek, and R. J. Otto 1978 17 p refs Presented at the CODATA Conf., Palermo, Italy, 22 May 1978
(Contract W-7405-eng-48)
(LBL-7827; CONF-780587-3) Avail: NTIS HC A02/MF A01

A data center containing bibliographic and numerical data was established to provide evaluated basic energy data on aqueous electrolyte solutions to elevated temperatures and pressures. Correlation equations and data are given for the viscosity, thermal conductivity, density, and enthalpy of aqueous sodium chloride solutions. DOE

N80-14227# Battelle Pacific Northwest Labs., Richland, Wash.
SIMULTANEOUS MASS DETECTION FOR DIRECT INLET MASS SPECTROMETRY
R. L. Gordon May 1979 79 p refs
(Contract EY-76-C-06-1830)
(PNL-2728) Avail: NTIS HC A05/MF A01

A direct inlet mass spectrometry (DIMS) instrument is described which consists of an inlet system designed to permit particles entrained in the inlet air stream to strike a hot, oxidized rhenium filament which serves as a surface ionization source. A mass analyzer and detection system then permits identification of the elemental composition of particulates which strike the filament. DOE

N80-14228# Argonne National Lab., Ill. Chemistry Div.
ELECTRON SPIN ECHO SPECTROSCOPY AND PHOTOSYNTHESIS
J. R. Norris, M. C. Thurnauer, M. K. Bowman, and A. D. Trifunac 1978 12 p refs Presented at Frontiers of Biol. Energetics: Electrons to Tissues Symp., Phila., 19 Jul. 1978
(Contract W-31-109-eng-38)
(CONF-780741-4) Avail: NTIS HC A02/MF A01

The high-power ESE technique was applied to primary photosynthesis observing stationary state signals arising from the primary donor, the primary acceptors, and the triplet state observed in R. rubrum. Nanosecond time-resolved ESE-EPR studies were performed of green plant photosynthesis. The ESE method employs repetitive trains of two or three intense microwave pulses to induce signals in paramagnetic samples known as echoes. The most common pulse sequence is the 90 deg T, 180 deg two-pulse sequence where T is the time between the two pulses. In the spectrometer used the 90 deg pulse (P sub 90) is approximately 30 nsec wide. Before P sub 90 the net magnetization M/sub z/ is aligned only along the external magnetic field direction z. P sub 90, as its name implies, rotates the resonant electron spins of M/sub z/ 90 deg such that immediately after the pulse these spins are in the x,y plane normal to the magnetic field. DOE

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-14229* National Aeronautics and Space Administration Pasadena Office, Calif.

METHOD OF PURIFYING METALLURGICAL GRADE SILICON EMPLOYING REDUCED PRESSURE ATMOSPHERIC CONTROL Patent
William M. Ingle (Motorola, Inc., Phoenix, Ariz.), Stephen W. Thompson (Motorola, Inc., Phoenix, Ariz.), and Robert E. Chaney, inventors (to NASA) (Motorola, Inc., Phoenix, Ariz.) Issued 30 Oct. 1979 4 p Filed 23 Jun. 1978 Supersedes N78-27255 (16 - 18, p 2373) Sponsored by NASA Prepared in cooperation with Motorola, Inc., Phoenix, Ariz.
(NASA-Case-NPO-14474-1; US-Patent-4,172,883; US-Patent-Appl-SN-918537; US-Patent-Class-423-348; US-Patent-Class-423-149; US-Patent-Class-423-293; US-Patent-Class-423-417; US-Patent-Class-423-625) Avail: US Patent and Trademark Office CSCL 11F

A method in which a quartz tube is charged with chunks of metallurgical grade silicon and/or a mixture of such chunks and high purity quartz sand, and impurities from a class including aluminum, boron, as well as certain transition metals including nickel, iron, and manganese is described. The tube is then evacuated and heated to a temperature within a range of 800 C to 1400 C. A stream of gas comprising a reactant, such as silicon tetrafluoride, is continuously delivered at low pressures through the charge for causing a metathetical reaction of impurities of the silicon and the reactant to occur for forming a volatile halide and leaving a residue of silicon of an improved purity. The reactant which included carbon monoxide gas and impurities such as iron and nickel react to form volatile carbonyls.
Official Gazette of the U.S. Patent and Trademark Office

N80-14230 Vanderbilt Univ., Nashville, Tenn.
THE ROLE OF PHOSPHORUS IN THE INTERGRANULAR EMBRITTLEMENT OF Fe-3Si Ph.D. Thesis
Raymond George Thompson 1979 178 p
Avail: Univ. Microfilms Order No. 7926629

A study was undertaken to elucidate the role of phosphorus in promoting intergranular embrittlement. The embrittled bicrystals were cryogenically fractured at temperatures to 4.2 K. The measured fracture energy was used to determine the grain boundary fracture surface energy, 2 gamma prime sub s - gamma sub b, which was correlated with the phosphorus concentration of the boundary. The results are discussed in relation to existing and proposed models for intergranular failure. Conclusions are drawn on the potency of phosphorus in reducing the grain boundary fracture energy. The effect of a reduced fracture energy on such mechanical properties as crack tip plasticity, twinning and transition temperature are also addressed. Dissert. Abstr.

N80-14231 Northwestern Univ., Evanston, Ill.
THE INFLUENCE OF MICROSTRUCTURE ON THE METAL CUTTING BEHAVIOR OF AISI 1215 RESULFURIZED FREE MACHINING-STEELS Ph.D. Thesis
Lynda Piethe Riekels 1979 435 p
Avail: Univ. Microfilms Order No. 7927433

An investigation was made of the relationship between the microstructural characteristics and the metal cutting behavior of two ingots of AISI 1215 resulfurized free machining steel of similar composition, solidified at different rates in order to obtain different MnS inclusion size distributions. A linear relationship was obtained between the inclusion parameter, S-S/V sub v (S), the quotient of the inter-sulfide spacing to the sulfide volume fraction, and the cutting energy requirement to which a confidence level greater than 99.9 percent could be attached. There was also a very good linear relationship between the effective flow stress on the shear plane and the cutting energy requirement. Evidence of void initiation and growth was found around MnS inclusions of fractured surfaces of chips broken below the ductile-brittle transition temperature. Dissert. Abstr.

N80-14232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED REFRACTORY COATINGS AND METHOD OF PRODUCING THE SAME Patent Application
W. A. Brainard and D. R. Wheeler, inventors (to NASA) Filed 12 Jul. 1979 7 p
(NASA-Case-LEW-13169-1; US-Patent-Appl-SN-102003) Avail: NTIS HC A02/MF A01 CSCL 11F

A thin sputtered film that exhibits improved adherence to a substrate and has improved friction and wear characteristics is described. These improvements are achieved by coating the substrate by rf sputtering with a film of titanium carbide using an argon sputtering plasma. A small nitrogen partial pressure from about 0.5% to 2.5% is added in the initial stages of the deposition during which the interface is formed. The improvements in adhesion of the titanium carbide coating to the substrate results from the presence of both titanium nitride and a nitride of the substrate in the interfacial region. NASA

N80-14233# Materials Research Labs., Melbourne (Australia). Materials Research Labs.
CORROSION IN THE AUSTRALIAN DEFENCE SCENE. 1: THE ARMY AND ANCILLARY EQUIPMENT FOR THE RAAF
Jeffrey J. Batten Aug. 1979 21 p Presented at Meeting of TTCP Sub-Group P, Tech. Panel P1 (Metals), Melbourne, May 1979
(MRL-R-752; AR-001-832) Avail: NTIS HC A02/MF A01

Although Australia purchases much of its advanced military equipment from other TTCP countries, there are differences between Australia and these countries with respect to usage and expected life of that equipment. These differences carry with them considerable corrosion penalties. Case histories of some of the more recurrent types of corrosion problems are described. It is concluded that the choice of correct materials, techniques and design are essential to reduce the number of these problems. Further, the technology which would have prevented their occurrence was already in existence. Thus, they mostly arose through lack of technology transfer from the corrosion scientist to the market place. Author

N80-14234*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORROSION RESISTANCE OF SODIUM SULFATE COATED COBALT-CHROMIUM-ALUMINUM ALLOYS AT 900 C, 1000 C, AND 1100 C
G. J. Santoro Nov. 1979 28 p refs
(NASA-TM-79311; E-267) Avail: NTIS HC A03/MF A01 CSCL 11F

The corrosion of sodium sulfate coated cobalt alloys was measured and the results compared to the cyclic oxidation of alloys with the same composition, and to the hot corrosion of compositionally equivalent nickel-base alloys. Cobalt alloys with sufficient aluminum content to form aluminum containing scales corrode less than their nickel-base counterparts. The cobalt alloys with lower aluminum levels form CoO scales and corrode more than their nickel-base counterparts which form NiO scales. M.G.

N80-14235*# AiResearch Mfg. Co., Phoenix, Ariz.
ABRADABLE COMPRESSOR AND TURBINE SEALS, VOLUME 1
D. V. Sundberg, R. E. Dennis, and L. G. Hurst May 1979 178 p
(Contract NAS3-20073)
(NASA-CR-159600; AiResearch-21-3213-1) Avail: NTIS HC A09/MF A01 CSCL 11A

The application and advantages of abradable coatings as gas-path seals in a general aviation turbine engine were evaluated for use on the high-pressure compressor, the high-pressure turbine, and the low-pressure turbine shrouds. Topics covered include: (1) the initial selection of candidate materials for interim full-scale engine testing; (2) interim engine testing of the initially selected materials and additional candidate materials; (3) the design of the component required to adapt the hardware to permit full-scale engine testing of the most promising materials; (4) finalization of the fabrication methods used in the manufacture of engine test hardware; and (5) the manufacture of the hardware necessary to support the final full-scale engine tests. A.R.H.

N80-14236# Connecticut Univ., Storrs. Inst. of Materials Science.
SURFACE HARDENING BY LASER SKIN MELTING Progress Report
Peter R. Strutt Jul. 1979 66 p refs
(Contract N00014-78-C-0580)

(AD-A074168; PR-1) Avail: NTIS HC A04/MF A01 CSCL 11/6

A basic study has been initiated on the microstructural characterization of rapid quenched iron-base alloys produced by electron beam-glazing and laser-glazing. The quantitative effect of processing parameters (i.e., beam velocity, power, etc.) on melt zone geometry have been determined using M2 tool steel as a reference material. The conditions range from superficial surface melting with correspondingly high cooling rates (similar to 1/1000000 C) to the deep penetration mode, with a cooling rate of similar to 1/1000 C. The comparison of electron beam and laser-glazing was particularly striking, since the power efficiency in surface melting was ten times greater using an electron beam. Furthermore, electron beam-glazing produced (1) a uniform and smooth surface, (2) a constant depth of melting, and (3) a homogeneous microstructure. These highly desireable features were not achieved to the same degree in the laser-glazing experiment. GRA

N80-14237# Argonne National Lab., Ill.
IODINE STRESS-CORROSION CRACKING IN IRRADIATED ZIRCALOY CLADDING
R. F. Mattas, F. L. Yaggee, and L. A. Neimark 1979 15 p refs Presented at ANS Topical Meeting on Light Water Reactor Fuel Performance, Portland, Oreg., 29 Apr. 1979
(Contract W-31-109-eng-38)
(CONF-790441-7) Avail: NTIS HC A02/MF A01

Irradiated Zircaloy cladding specimens, were gas-pressure tested in an iodine environment to investigate their stress-corrosion cracking (SCC) susceptibility. The test temperatures and hoop stresses ranged from 320 to 360 C and 150 to 500 MPa, respectively. It was shown that irradiation, in general, increases the susceptibility of Zircaloy to iodine SCC. For specimens that experienced fluences > 2 x 10 to the 21st power n/sq cm (E > 0.1 MeV), the 24 h failure stress was 177 + or - 18 MPa, regardless of the preirradiation metallurgical condition. An analytical model for iodine SCC was developed which agrees reasonably well with the test results. DOE

N80-14238# Idaho National Engineering Lab., Idaho Falls.
ESTIMATING STRUCTURAL INTEGRITY OF TYPE 304 STAINLESS STEEL PLATES AND PIPES CONTAINING SMALL DEFECTS
1979 20 p refs Presented at the Intern. Conf. on Structural Mech. in Reactor Technol., Berlin, 13 Aug. 1979
(Contract EY-76-C-07-1570)
(CONF-790802-11) Avail: NTIS HC A02/MF A01

Preliminary test program results and some evaluations of reactor coolant piping as well as less ductile plate and piping models, specifically, the flow stress approach and the two-parameter fracture criterion are presented. The tests were conducted with annealed Type 304 stainless steel flat tensile specimens containing triangular, rectangular, or part-circular surface flaws, and pressurized pipe specimens with internal or external triangular surface defects. DOE

N80-14239# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.
HIGH STRENGTH AUSTENITIC ALLOYS FOR GENERATOR RETAINING RINGS Interim Report
J. W. Morris, Jr. and G. Thomas Apr. 1979 93 p refs
(EPRI-FP-1061) Avail: NTIS HC A05/MF A01

A nonmagnetic, hydrogen resistant alloy which achieves strength levels near 200 ksi yield with good residual toughness while permitting processing primarily through thermal treatment was developed. Strength and toughness objectives were achieved through the use of alloys which have met the other necessary criteria. Fatigue and fracture toughness testing in hydrogen was initiated to determine suitability of precipitation hardened alloys based on the Fe-Ni-Ti-Ta system for use in a hydrogen environment. DOE

N80-14240# Argonne National Lab., Ill.
MICROSTRUCTURAL OBSERVATIONS ON TIME-DEPENDENT FAILURE IN WELD-DEPOSITED TYPE 16-8-2 STAINLESS STEEL
D. T. Raske and D. R. Diercks 1978 13 p refs Presented at Bolton Landing Conf., Lake George, N.Y., 27 Aug. 1978
(Contract W-7405-eng-38)
(CONF-780834-2) Avail: NTIS HC A02/MF A01

Type 16-8-2 stainless steel weld metal is less resistant to rupture than Type 316 stainless steel base metal under monotonic creep conditions, but is substantially more resistant to failure under conditions of fatigue and combined creep and fatigue. Fractographic and metallographic analyses indicate that specimens from the two types of tests differ in failure modes. In monotonic-creep tests, the Type 16-8-2 weld-metal specimens failed by intergranular and interphase separation followed by microvoid growth and coalescence. Under creep-fatigue conditions, failure occurred by a mixture of matrix and interphase cracking, with substantial transgranular cracking present. Results indicate that the resistance of Type 16-8-2 weld metal to creep-fatigue failure is directly related to its resistance to grain-boundary and interphase cracking. DOE

N80-14241# Sandia Labs., Livermore, Calif.
PALLADIUM SINTERING: SHRINKAGE KINETICS FOR A SPONGE POWDER
R. M. German and V. Ham Apr. 1979 18 p refs
(Contract EY-76-C-04-0789)
(SAND-78-8207) Avail: NTIS HC A02/MF A01

Pellets pressed from sponge palladium powder were sintered both isothermally and with constant heating rates using a dilatometer. Computer analysis of the data is used to determine shrinkage and shrinkage rate behavior during the sintering operation. The data are used in conjunction with metallographic examination to correlate the shrinkage phenomena to the change in grain size and pore morphology. DOE

N80-14242# Oak Ridge National Lab., Tenn.
EFFECT OF OXIDIZING ENVIRONMENT ON MECHANICAL PROPERTIES OF MOLYBDENUM AND TZM
C. T. Liu, S. H. Anderson, and H. Inouye Oct. 1978 39 p refs
(Contract W-7405-eng-26)
(ORNL-5431) Avail: NTIS HC A03/MF A01

In low-pressure (1.3 mPa) oxygen at 1150 C, specimens of titanium zirconium molybdenum (TZM) picked up oxygen and lost carbon. The oxygen concentration increased linearly with exposure time, indicating that the chemisorption of oxygen molecules at the specimen surface, rather than bulk diffusion, controls the kinetics of oxygen absorption at 1150 C. Specimens of TZM increase in tensile strength and decrease in ductility with increasing oxygen content. Exposed TZM loses its ductility at elevated temperatures at an oxygen level of 500 ppM. Unalloyed molybdenum showed no internal oxidation at 1150 C. Results indicate that a trace of oxygen penetrated into molybdenum through its grain boundaries. This penetration raises the ductile-to-brittle transition temperature of molybdenum by 200 C and lowers the ductility above 900 C. The ductility of oxygen exposed molybdenum is virtually unaffected in the temperature range from 400 to 900 C. A ductility minimum (10 percent) is observed at 1350 C because of dynamic embrittlement effects. DOE

N80-14243# Office National d'Etudes et de Recherches Aerospatiales, Leclerc (France). Lab. Thermochimie et Frittage.
THE IMPROVEMENT OF REFRACTORY ALLOYS THROUGH POWDER METALLURGY INVOLVING SINTERING WITH SPINNING Final Report [ELABORATION D'ALLIAGES REFRACTAIRES PAR METALLURGIE DES POUDRES AU MOYEN DU FRITTAGE-FILAGE]
Andre Hivart, Michel Marty, and Andre Walder Aug. 1978 44 p refs In FRENCH
(Contracts DGRST-73-7-1813; DGRST-75-7-0992)
(ONERA-RT-12/1931-MY) Avail: NTIS HC A03/MF A01

Several powder metallurgy manufacturing processes for hot turbine disks using IN-100 and Astroloy alloys were tested in order to avoid the macro crystallization and phase separation introduced by casting. The influence of powder characteristics, compactation processes (spinning or isostatic hot compression), and of thermal treatments were studied in particular. It is concluded that powder metallurgy gives superior properties in the lower temperature range, up to 750 C. Spinning is the best compaction method for refractory alloys with normal carbon content. Author (ESA)

N80-14244# National Bureau of Standards, Washington, D.C.
MATERIALS STUDIES FOR MAGNETIC FUSION ENERGY APPLICATIONS AT LOW TEMPERATURES-II
F. R. Fickett, ed. and R. P. Reed, ed. Jun. 1979 495 p refs Sponsored in part by DOE, Washington, D.C.
(PB-299288/1; NBSIR-79-1609) Avail: NTIS HC A21/MF A01 CSCL 11F

An evaluation is presented of the low temperature mechanical and physical properties of stainless steel base metal and welds, with particular emphasis on nitrogen strengthened stainless steels. Aluminum alloys received some consideration. Work was done on the production of nonmetallics, primarily industrial laminates for low temperature applications and on the measurement of their properties at cryogenic temperatures. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-14245 Texas Univ. at Austin.
POLYSTYRENE IN MIXED SOLVENTS Ph.D. Thesis
Tejraj Malleshappa Aminabhavi 1979 250 p
Avail: Univ. Microfilms Order No. 7928255

Polystyrene in mixed solvents was extensively studied both experimentally and theoretically from thermodynamic, hydrodynamic and optical viewpoints to achieve a better quantitative understanding of polymer solutions. The experimental techniques included precision refractometry, ultracentrifugation, densitometry and viscometry. The computer was used extensively to analyze the experimental data. Binary solvent mixtures and polymers in mixed solvents were investigated using densitometric and refractometric techniques. The diffusion coefficients which were obtained for binary solvent mixtures and for polystyrene samples in these mixtures were analyzed. Dissert. Abstr.

N80-14246 Polytechnic Inst. of New York.
SYNTHESES AND CHARACTERIZATION OF NEW FLUORINATED KETONE CONTAINING POLYMERS-SUBSTITUTED POLYSTYRENES AND THE STUDY OF THEIR REACTIONS WITH ALCOHOLS Ph.D. Thesis
Chung-Heng Cheng 1979 107 p
Avail: Univ. Microfilms Order No. 7920773

A series of new fluorinated ketone containing polymers, were prepared by the free radical polymerization of the corresponding monomers. These new substituted polystyrenes containing fluorinated ketone functionality were characterized by their ability (1) to react with active hydrogen compounds such as alcohols or water; (2) to have high glass transition temperatures and decreased solubility in nonpolar solvents (e.g., benzene) compared to polystyrene; and (3) to be converted into other functional groups such as alcohols or acids by treatment with the appropriate chemical reagents. Dissert. Abstr.

N80-14247 Alfred Univ., N.Y.
EFFECT OF SILVER ON THE STRUCTURE AND PROPERTIES OF ARSENIC-TRISULFIDE GLASS Ph.D. Thesis
Kewal Krishnan Varma 1977 145 p
Avail: Univ. Microfilms Order No. 7927210

The electrical properties and several structure sensitive properties of As2S3 glasses, containing up to 1.0 atomic percent silver were investigated. The electrical conductivity is found to increase by nearly three orders of magnitude when 1.0 percent Ag is added to As2S3. Structure sensitive properties such as density, glass transition temperature, and specific heat exhibit anomalous behavior in the same compositional range. Results are interpreted in terms of a self-trapped hole defect postulated to be present in the pure glass. The concentration of these defects depends on the preparation procedure, thermal history and silver content of the glass. Dissert. Abstr.

N80-14248*# National Aeronautics and Space Administration, Washington, D. C.
PROCEDURE FOR THE FORMATION OF A COATING ON AN OBJECT BY POLYMERIZATION BY LUMINESCENT DISCHARGE
Dec. 1979 11 p Transl. into ENGLISH of French Patent no. 1,488,513 (File no. 70.723, 25 Jul. 1966) 5 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75926) Avail: NTIS HC A02/MF A01 CSCL 07D

The object to be coated was placed in a reaction area located in a luminescent discharge chamber. By introducing the polymerizable material in this reaction area and applying an electrical field to this reaction, a polymerized film was obtained on the coating object under controlled conditions. By the use of thermomechanical treatment on the object, the undesirable effects of discoloration, brittleness, and viscosity can be controlled.
M.M.M.

N80-14249*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF PLASMA-SPRAYED COATINGS CONTAINING COBALT ALLOYS FROM 25 DEG TO 650 DEG IN AIR
Harold E. Sliney and Thomas P. Jacobson 1979 20 p refs
(NASA-TM-79316; E-189) Avail: NTIS HC A02/MF A01 CSCL 11F

Four different compositions of self-lubricating, plasma-sprayed, composite coatings with calcium fluoride dispersed throughout cobalt alloy-silver matrices were evaluated on a friction and wear apparatus. In addition, coatings of the cobalt alloys alone and one coating with a nickel alloy-silver matrix were evaluated for comparison. The wear specimens consisted of two, diametrically opposed, flat rub shoes sliding on the coated, cylindrical surface of a rotating disk. Two of the cobalt composite coatings gave a friction coefficient of about 0.25 and low wear at room temperature, 400 and 650 C. Wear rates were lower than those of the cobalt alloys alone or the nickel alloy composite coating. However, oxidation limited the maximum useful temperature of the cobalt composite coating to about 650 C compared to about 900 C for the nickel composite coating.
Author

N80-14250# Illinois Univ. at Urbana-Champaign. Dept. of Chemistry.
PREPARATION AND CATALYTIC OXIDIZING POTENTIAL OF POLYMER SUPPORTED CHELATING AMINE AND SCHIFF BASE COMPLEXES Interim Technical Report
Russell S. Drago, John Gaul, Alan Zombeck, and Darel K. Straub 10 Jul. 1979 38 p refs
(Contract N00014-78-C-0245; NR Proj. 348-675)
(AD-A073878; ONR-TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/3

Synthetic procedures for attaching multidentate amines to organic polymers are described. These materials form the basis for the preparation of a wide variety of macrocyclic and chelating ligands that can be covalently attached to polymers. The reaction to produce Schiff base chelates is described and a series of covalently attached metal complexes is prepared and identified. These systems have potential as catalysts for organic oxidations. GRA

N80-14251# Northwestern Univ., Evanston, Ill. Dept. of Chemistry and Materials Research Center.
CONDUCTIVE POLYMERS CONSISTING OF PARTIALLY OXIDIZED, FACE-TO-FACE LINKED METALLOMACROCYCLES Interim Report
Karl F. Schoch, Jr., Bhagyashree R. Kundalkar, and Tobin J. Marks 17 Sep. 1979 21 p refs Submitted for publication
(Contract N00014-77-C-0231; Grant NSF DMR-78-80847; NR Proj. 053-640)
(AD-A074538; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/4

This communication reports on an approach to control molecular stacking interactions in low-dimensional mixed valence materials by locking partially oxidized metallomacrocycles together in a face-to-face orientation. Iodine doping of the face-to-face linked oligomers produces electrically conductive polymers with a range of stoichiometries. Electronic and lattice structures have been studied by resonance Raman spectroscopy, which indicates the presence of I3(-) or I5(-) but no I2, and by X-ray powder

diffraction, which allows estimation of the interplanar (ring-ring) spacings. GRA

N80-14252# Westinghouse Research and Development Center, Pittsburgh, Pa.
MONOLITHIC TRANSFORMATION OF CERAMIC MATERIALS FROM METAL-ORGANIC SOLS AND GELS Final Report, 1 Jul. 1977 - 30 Jun. 1979
B. E. Yoldas, D. P. Partlow, and D. M. Mattox 20 Jul. 1979 43 p refs
(Contract DAAG29-77-C-0029)
(AD-A074181; ARO-13970.1-MS) Avail: NTIS HC A03/MF A01 CSCL 11/2

The process used to form monolithic transparent Al2O3 bodies from metal-organic starting materials at low temperature via the gel process involves essentially four steps: hydrolysis, peptization, gel formation, and pyrolysis. Each step has been systematically investigated by modification of associated variables in order to determine the combination of factors which produces optimum results. It has been found that the interparticle distance, that is, the extent of approach attained by colloidal particles, at the point of gelling is of critical importance in maintaining monolithicity during the gel-oxide conversion. Minimization of this distance not only reduces the amount of shrinkage necessary during liberation of organics, allowing the body to remain in one piece, but also appears to allow interparticle bond formation during drying and pyrolysis, possibly involving hydroxyl and alkyl groups. For this reason, the factors that provide for the closest approach of gel particles were given particular attention in this investigation. GRA

N80-14253# California Univ., Livermore. Lawrence Livermore Lab.
CHARACTERIZATION OF DC-S-2000 SILICONE RUBBER AS AN O-RING MATERIAL FOR LASER AMPLIFIER SYSTEMS
D. M. Hoffman 23 Mar. 1979 14 p refs
(Contract W-7405-eng-48)
(UCRL-52688) Avail: NTIS HC A02/MF A01

The mechanical, thermal, thermodynamic, and chemical properties of DC-S-2000, a silicone rubber filled with silica, were evaluated. The properties of a batch cured inhouse were compared with the manufacturer's specifications, and specific quality-control tests were developed to evaluate future production batches of this elastomer. Mechanical and thermal transitions not described in the manufacturer's bulletin were also considered. Because the silicone O-rings must function under prolonged compression, an examination of the compression properties of DC-S-2000 is recommended. DOE

N80-14254# Oak Ridge Y-12 Plant, Tenn.
INFRARED INTERFEROMETRIC THICKNESS MEASUREMENT OF POLYMERIC THIN FILMS AND COATINGS
N. R. Smyrl 26 Jun. 1979 20 p refs
(Contract W-7405-eng-26)
(Y-2176) Avail: NTIS HC A02/MF A01

Thickness measurements utilizing state of the art rapid-scan interferometric technology were demonstrated for possible future applications. DOE

N80-14255# Toulouse Univ. (France). Lab. de Genie Electriques.
THE USE OF CHELATES TO NEUTRALIZE DEFECTS GIVING RISE TO PARTIAL DISCHARGES IN INSULATING MATERIALS OTHER THAN POLYETHYLENE: THE PARTICULAR CASE OF EPOXY RESINS Progress Report [UTILISATION DES CHELATES COMME AGENTS CICATRISANTS DES DEFAUTS QUI SONT LE SIEGE DES DECHARGES PARTIELLES DANS LES ISOLANTS AUTRES QUE LE POLYETHYELENE. CAS PARTICULIER DES RESINES EPOXYDES]
BuiAi, Hurax, and Roger-Vercruysse Dec. 1978 22 p refs In FRENCH
(Publ-379) Avail: NTIS HC A02/MF A01

The effect of metallic chelates in increasing the insulating films partial discharge initiation voltage, as was already demonstrated for polyethylene, was explored for the case of epoxy resins. The results show that the direct current resistivity increases slightly, that a space charge is formed when the electric field is larger than 4 kV/mm, and that the electric rigidity under continuous tension increases strongly, but much less in the case of 50 Hz alternating current. Possible mechanisms of the chelate effect are discussed. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.*

N80-14256# Lockheed-Georgia Co., Marietta.
AIRCRAFT FUEL SYSTEM SIMULATOR TESTS WITH ANTIMISTING KEROSENE (JET A FUEL WITH FM-9 ADDITIVE) Final Report, Oct. 1978 - May 1979
R. E. Pardue May 1979 50 p
(Contract DOT-FA78WAI-925)
(AD-A073237; FAA-RD-79-52) Avail: NTIS HC A03/MF A01 CSCL 21/4

Tests were conducted on a full-scale C-141 aircraft fuel system simulator to evaluate system and component operation using antimisting kerosene fuels (Jet A fuel with FM-9 additive). A typical aircraft flight profile was simulated with the tank-to-engine fuel feed system operating. Tests were also conducted to evaluate the tank quantity gaging system accuracy, tank refuel valve operation and fuel transfer ejector operation. Fuels tested included Jet A, .30% FM-9 AMK, .35% FM-9 AMK and .40% FM-9 AMK. Flammability tests were conducted on selected fuel samples to evaluate degradation caused by the above tests. Author

N80-14257*# National Bureau of Standards, Washington, D.C. Thermophysical Properties Div.
THERMODYNAMIC PROPERTIES OF NITROGEN GAS DERIVED FROM MEASUREMENTS OF SOUND SPEED
Ben Younglove and R. D. McCarty Washington NASA Dec. 1979 56 p refs
(NASA Order L-55450-A; NASA Order L-69159-A)
(NASA-RP-1051; NBSIR-79-1611; L-13308) Avail: NTIS HC A04/MF A01 CSCL 07D

A virial equation of state for nitrogen was determined by use of newly measured speed-of-sound data and existing pressure-density-temperature data in a multiproperty-fitting technique. The experimental data taken were chosen to optimize the equation of state for a pressure range of 0 to 10 atm and for a temperature range of 80 to 350 K. Comparisons are made for thermodynamic properties calculated both from the new equation and from existing equations of state. Author

N80-14258# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF THE STEAM-IRON PROCESS FOR HYDROGEN PRODUCTION, 9010 Quarterly Report, 1 Apr. - 30 Jun. 1978
Feb. 1979 62 p
(Contract EX-76-C-01-2435)
(FE-2435-32; QR-8) HC A04/MF A01

The operability of the two reactor steam-iron process was demonstrated for an extended period of time, and hydrogen was produced for the first time. Test 15 spanned a period of 24 days and included 106 hours of ore circulation, 36 hours of char feed, and 24 hours of self-sustained hydrogen production. The primary objective of this test was to demonstrate the operability of the steam-iron process. Producer bed temperatures were limited to 1600 F at 200 psig reactor pressure. The quantity of hydrogen produced, therefore, was low. Test 16, the second consecutive hydrogen-producing test, spanned a period of 7 days. Producer bed temperatures were increased to 1650 F to raise the production of hydrogen in the steam-iron reactor. As in Test 15, the reactor internals were completely clean and in excellent condition following the test. DOE

N80-14259# Naval Research Lab., Washington, D. C.
MICROBIAL DETERIORATION OF HYDROCARBON FUELS FROM OIL SHALE, COAL, AND PETROLEUM. 1: EXPLOR-

ATORY EXPERIMENTS Interim Report
Marian E. May and Rex A. Neihof 20 Aug. 1979 28 p refs (ZF57571004)
(AD-A073761; AD-E000316; NRL-MR-4060) Avail: NTIS HC A03/MF A01 CSCL 21/4

As part of the Navy's program on alternative sources of hydrocarbon fuel, the susceptibility to microbial deterioration of JP-5 derived from oil shale and coal (referred to as synthetic fuels) was investigated and compared with that of petroleum JP-5. Six fungi, including three strains of Cladosporium resinae, a yeast (Candida) and a bacterium (Pseudomonas) which normally grow well in association with petroleum JP-5 were used as test organisms in two-phase systems containing fuel/aqueous media. Most of the test organisms were inhibited to various extents in the presence of the synthetic fuels. An exception was a Fusarium species (fungus) which grew equally well under all three fuels. In mixtures of 75% petroleum and 25% synthetic fuels, microbial growth was generally equivalent to that in 100% petroleum JP-5. A search was made among samples of soil, creosoted wood and tree resins for microorganisms that could thrive in the presence of synthetic fuels. This endeavor produced a strain of C. resinae that grew as well with oil shale JP-5 as with petroleum JP-5. These exploratory experiments indicate that microorganisms adapted to growth with conventional petroleum fuel tend to be inhibited by synthetic fuels, but that organisms probably exist in nature which can readily adapt to and grow in the presence of synthetic fuels. GRA

N80-14260# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
THE DEVELOPMENT OF IMPROVED NORMAL STRESS TRANSDUCERS FOR PROPELLANT GRAINS, VOLUME 1 Final Report, Mar. 1975 - Dec. 1978
E. C. Francis, R. E. Thompson, and W. E. Briggs Edwards AFB AFRPL Jun. 1979 271 p refs 2 Vol.
(Contract F04611-75-C-0042; AF Proj. 5730)
(AD-A073659; CSD-2548-FR-Vol-1; AFRPL-TR-79-34-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 09/1

This report details the CSD effort in the design, analysis, manufacturing, calibration, and embedded use of improved normal stress transducers. Prototype transducers from two different contractors were manufactured and tested as well as final production transducer models. Finite element analysis techniques used for transducer analysis are extensively covered and were used for design optimization and gage interpretation. Results covering gaseous nitrogen calibrations, long term stability, self-heating, diode effects, embedded thermal and pressurization loadings, and mechanical tests are presented and compared with design goals. Detailed manufacturing specifications are presented along with recommended calibration and installation techniques. The final transducer design is 0.130-in. high with an external prewired compensation package. Stability of the metal and epoxy bond has been optimized by special processing techniques which are presented. Several significant achievements were obtained during the program. The first computerized design tradeoff curves were generated for stress transducers. Successful electron beam welding of critical components on stress transducers was demonstrated. Transducer measured stress in the propellant was verified independently in the tension-compression-shear and TM-1 devices. Transducer response under high rate loading conditions was demonstrated. Agreement between predicted and measured stresses for a thermal loaded solid propellant motor using the thermal-mechanical interaction factor was achieved. GRA

N80-14261# United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
THE DEVELOPMENT OF IMPROVED NORMAL STRESS TRANSDUCERS FOR PROPELLANT GRAINS. VOLUME 2: APPENDICES Final Report, Mar. 1975 - Dec. 1978
E. C. Francis, R. E. Thompson, and W. E. Briggs Edwards AFB AFRPL Jun. 1979 334 p
(Contract F04611-75-C-0042; AF Proj. 5730)
(AD-A073660; CSD-2548-FR-Vol-2; AFRPL-TR-79-34-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 09/1

The design, analysis, and calibration of normal stress transducers are appended. Final design specifications are presented along with test procedures and troubleshooting guides, temperature sensor specifications and calibrations, and results of long term stability and epoxy creep evaluation tests. K.L.

N80-14262# Space Sciences, Inc., Monrovia, Calif.
A MASS-SPECTROMETRIC INVESTIGATION OF THE DECOMPOSITION PRODUCTS OF ADVANCED PROPELLANTS AND EXPLOSIVES Annual Summary Report
Milton Farber and R. D. Srivastava Aug. 1979 43 p refs
(Contract N00014-75-C-0986)
(AD-A074963) Avail: NTIS HC A03/MF A01 CSCL 21/9

The results of a mass spectrometric study of several advanced propellants and explosives to determine the chemistry and kinetics of their decompositon are presented. The technical program involved three propellant groups: (1) ignition and thermal decomposition of advanced lead organic additive propellants; (2) sublimation and thermal decomposition of trinitro-triamino benzene; and (3) sublimation and thermal decomposition of 1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane (HMX). GRA

N80-14263# Institute of Gas Technology, Chicago, Ill.
HIGH-Btu COAL GASIFICATION PROCESSES
C. F. Blazek, N. R. Baker, and R. R. Tison Jan. 1979 82 p refs Prepared for Argonne National Lab.
(Contract W-31-109-eng-38)
(ANL/CES/TE-79-2) Avail: NTIS HC A05/MF A01

Estimates of performance and cost data for advanced technology, high-Btu, coal gasification facilities are provided. The six processes discussed reflect the current state-of-the-art development. The information presented is based only on pilot-plant experience. Performance characteristics that were investigated include unit efficiencies, product output, and pollution aspects. Total installed plant costs and operating costs are tabulated for the various processes. The information supplied is expected to assist in selecting energy conversion units for an Integrated Community Energy System. DOE

N80-14264# SRI International Corp., Menlo Park, Calif.
PROCEEDINGS OF THE 1978 COAL CHEMISTRY WORKSHOP
S. B. Radding and Howard M. Peters Nov. 1978 204 p refs Conf. held at Menlo Park, Calif., 8-10 Mar. 1978
(Contract ET-78-X-01-2402)
(CONF-780372) Avail: NTIS HC A10/MF A01

The structural chemical analysis of coal and the chemistry of coal gasification and coal liquefaction are discussed. The DOE Fossil Energy Program is discussed in detail and recommendations for further research in coal gasification and coal liquefaction are made. DOE

N80-14265# Argonne National Lab., Ill.
EXPERIMENTAL VERIFICATION OF THE MERCURY-IODINE THERMOCHEMICAL CYCLE FOR THE PRODUCTION OF HYDROGEN FROM WATER, ANL-4
E. H. Appelman, F. Schreiner, and B. M. Abraham 1978 58 p refs Presented at the World Hydrogen Energy Conf., Zurich, 21 Aug. 1978
(Contract W-31-109-eng-38)
(CONF-780807-11) Avail: NTIS HC A04/MF A01

A flow diagram for the cycle described was constructed and an overall practical efficiency of 28% in terms of delta G/sub f (H2O)/total heat input) was estimated from the new data. A substantial portion of the total heat input is required for the isolation of the ammonium iodide. The cycle should be capable of producing hydrogen from water with reasonable efficiency and without requiring heat at an unduly high temperature. The cycle should therefore be suitable for a practical demonstration of the technical feasibility of thermochemical hydrogen generation. DOE

N80-14266# Department of Energy, Washington, D. C. Div. of Environmental Control Technology.
LIQUEFIED GASEOUS FUELS SAFETY AND ENVIRONMENTAL CONTROL ASSESSMENT PROGRAM Progress Report
May 1979 725 p refs
(Contracts EP-78-C-03-2057; EP-78-C-05-6020; EP-78-C-02-4734; EE-77-S-02-4204; EE-77-S-02-4447; EE-77-S-02-4548; EY-76-C-06-1830)
(DOE/EV-0036) Avail: NTIS HC A99/MF A01

Research is reported on the safety and environmental aspects of liquefied gaseous fuels including natural gas, petroleum gas, hydrogen, and ammonia. Spills and fires are among the handling, storage, and transportation hazards assessed. K.L.

N80-14267# California Univ., Livermore. Lawrence Livermore Lab.
HEATS AND PRODUCTS OF DETONATION OF TNT UNDER VARYING CONDITIONS OF CONFINEMENT AND DENSITY
D. L. Ornellas and R. R. McGuire 20 Jun. 1979 9 p refs
(Contract W-7405-eng-48)
(UCID-18211) Avail: NTIS HC A02/MF A01

A detonation calorimeter was used to determine the heat and products of detonation of TNT. Values were obtained at density 1.53 g/cu cm for charges that were unconfined and for charges which were heavily confined in gold, Pyrex glass, and alumina and at density 1.0 g/cu cm for charges that were unconfined and heavily confined in gold and sodium chloride. The heats of detonation calculated from the heats of formation of TNT and the observed products are reported. Material recoveries are generally in good agreement with predictions based on previous experience. DOE

N80-14268# Natural Dynamics, Des Moines, Iowa.
FAST PRODUCTION OF METHANE BY ANAEROBIC DIGESTION, VOLUME 1 Final Report, 24 May 1976 - 31 Dec. 1978
C. D. Finney, R. S. Evans, II, and K. A. Finney Dec. 1978 123 p refs
(Contract EY-76-C-02-2900)
(CDO-2900-17-Vol-1) Avail: NTIS HC A06/MF A01

For optimal performance in the production of methane from solid waste by anaerobic digestion, hydrolysis must be separated from gasification. Characterization with glucose as substrate revealed 70 C to be the maximal thermophilic temperature, since, beyond that limit, a buildup of acids was observed. Analysis of volumetric rate coefficients for the disappearance of reducing sugars, soluble COD, and volatile acids, and for the appearance of methane suggests that the region near 62 C is the optimal thermophilic temperature. There is a purely economic justification for a two-stage technology: the masses of bacterial cells and methane were seen to be about equal, and the protein content of the concentrated cells has potential as a premium agricultural feedstock. DOE

N80-14269# Midwest Research Inst., Golden, Colo.
ROUGH COST ESTIMATES OF SOLAR THERMAL/COAL OR BIOMASS-DERIVED FUELS
R. J. Copeland 1979 8 p refs Presented at AIAA Terrestrial Energy Systems Conf., Orlando, Fla., 4 Jun. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-35-279; CONF-790611-5) Avail: NTIS HC A02/MF A01

Cost data for one method of producing synthetic methane is presented. A hybrid approach was chosen, a combination of solar thermal and either coal or biomass. The magnitude of the solar thermal resource is estimated as well as projected cost. Cost projections for coal and biomass are accumulated. The cost of synthetic gas from a hybrid and a conventional fuel source are compared. DOE

N80-14270# Illinois Univ., Urbana. Dept. of Civil Engineering.
BIOLOGICAL CONVERSION OF BIOMASS TO METHANE Quarterly Progress Report, 1 Sep. - 30 Nov. 1978
J. T. Pfeffer Dec. 1978 14 p ref
(Contract EY-76-S-02-2917)
(CDO-2917-12) Avail: NTIS HC A02/MF A01

The viability of wheat straw as a feedstock for methane production by anaerobic digestion was investigated and the results obtained compared with that obtained with corn stover. Poor conversion was obtained with the wheat straw under thermophilic conditions, but better than that obtained with corn. In addition the residue has no value as an animal feed. A mild thermochemical pretreatment of the corn prior to anaerobic digestion improved the conversion efficiency and the value of the residue as an animal feed. It is assumed that similar pretreatment of wheat straw would improve its conversion efficiency. Slurry and pumping characteristics of wheat straw particles were reported. DOE

N80-14271# Argonne National Lab., Ill.
FUSARIUM SPECIES: THEIR POTENTIAL FOR TRANSFORMING BIOMASS TO ETHANOL
Antonios A. Antonopoulos Feb. 1979 26 p refs
(Contract W-31-109-eng-38)
(ANL/EES-TM-38) Avail: NTIS HC A03/MF A01

Unlike yeasts and other fungi, Fusaria can ferment both pentoses and hexoses (yeast can ferment only hexoses), and are able to saccharify the cell wall and middle lamella constituents and ferment the released sugar units. Existing research data support well the idea of utilizing selected Fusarium strains to decompose and convert biomass to ethyl alcohol. Since ethanol blends and performs effectively with gasoline (as gasohol), its yield through the Fusarium fermentative action should be exploited. Certain biological, technological, and economic limitations that constrain the application of biomass conversion to ethanol by Fusarium strains today, on a large scale, could be overcome through additional research and development. DOE

N80-14272# California Univ., Davis. Dept. of Agricultural Engineering.
PILOT PLANT GASIFICATION TEST ON BIOMASS FUELS Interim Report, Jun. - Nov. 1978
John R. Goss Jun. 1979 79 p Sponsored by Calif. State Energy Resources Conserv. and Develop. Comm.
(PB-299077/8; CAEC-36; CAEC-500-79-007) Avail: NTIS HC A05/MF A01 CSCL 07A

A scaled-up version of Swedish down-draft gasifiers, capable of producing 8 million Btu of gas per hour from agricultural and forestry residues, operated over 500 hours which included a continuous run of 330 hours. The gas from the gasifier was burned in a boiler to produce steam, burned in a low-Btu burner to produce heated air, and burned in a 60 kw diesel engine to generate electricity. Data are presented on the operating characteristics, environmental impacts, and equipment costs of the gasifier system. The technical feasibility and requirements of firing steam boilers with low-Btu gas from a gasifier fueled with wood chips was demonstrated. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-14273*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
ASSESSMENT OF PRESENT STATE-OF-THE-ART SAWING TECHNOLOGY OF LARGE DIAMETER INGOTS FOR SOLAR SHEET MATERIAL Final Report, 1 Sep. 1977 - 28 Feb. 1978
H. I. Yoo 1978 126 p refs
(Contract JPL-954830)
(NASA-CR-162535; DOE/JPL-954830-78/2) Avail: NTIS HC A07/MF A01 CSCL 13H

Work is reported on: (1) slicing of the ingots with the multiblade slurry saw, the multiwire slurry saw and the I.D. saw, (2) characterization of the sliced wafers, and (3) analysis of add-on slicing cost based on Solar Array Manufacturing Industry Costing Standard. M.M.M.

N80-14274# New York State Dept. of Transportation, Albany. Engineering Research and Development Bureau.
CONSTRUCTION OF AN ICE-RETARDANT OVERLAY
Robert J. Nittinger Jun. 1979 28 p refs
(PB-298876/4; FHWA/NY-79/RR-72; RR-79-72) Avail: NTIS HC A03/MF A01 CSCL 13B

A calcium chloride asphalt additive, developed to alleviate ice formation on pavements, is discussed. Problems encountered in batching operations and laboratory testing are reported. Construction procedures, skid resistance, and overall pavement appearance are documented. It was found that automated batching could not be used because the additive was held in the mineral filler bin and added after the introduction of bitumen. Manual

batching thus was required. Due to the additive's hygroscopic state, laboratory test results were erratic. No unusual problems were found during construction; the pavement became oily in appearance, but tests produced adequate skid numbers, and after two rainstorms and heavy traffic the pavement appeared dry. GRA

N80-14275# Maryland Univ., College Park. Dept. of Fire Protection Engineering.
A STUDY OF FIRE SAFETY EFFECTIVENESS STATEMENTS Final Report
Jack Watts, James A. Milke, John L. Bryan, Rachel Dardis, and Vincent Brannigan 2 Jan. 1979 172 p refs
(Contract USFA-C-7-35563)
(PB-299169/3) Avail: NTIS HC A08/MF A01 CSCL 13L

Key factors affecting life safety from fire in buildings are identified through analyses of variables obtained from a literature review. Existing systematic methods for grading fire safety are reviewed and evaluated for their potential in formulating Fire Safety Effectiveness Statements. None of the existing methods are found to be fully appropriate, hence utilization of the key life safety factors is suggested as a method to satisfy immediate needs to evaluate the level of fire safety in existing buildings. Concepts of implementation of Fire Safety Effectiveness Statements are addressed, specifically, measurability of key life safety factors, economic impact, and socio-legal utility. GRA

N80-14276# Urban Inst., Washington, D.C.
FIRE-CODE INSPECTIONS AND FIRE PREVENTION: WHAT METHODS LEAD TO SUCCESS Final Report
John R. Hall, Jr., Michael J. Karter, Jr., Margo Koss, Alfred H. Schainblatt, and Thomas C. McNerney Dec. 1978 141 p refs
Sponsored in part by Fire Administration
(Grant NSF APR-76-19148)
(PB-298991/1) Avail: NTIS HC A07/MF A01 CSCL 13L

Research is undertaken to determine whether some fire-code inspection practices result in fewer fires, lower fire loss, and fewer civilian casualties in properties covered by fire codes (excluding one and two-family residences) than do other fire-code inspection practices. The research involved (1) identifying the fires and civilian fire casualties that are potentially preventable by inspection and measuring the proportion of fires and casualties which are of that type; (2) relating differences in characteristics of fire-code inspection practices to differences in fire rates for a representative group of cities; and (3) examining the circumstances of major casualty incidents across the country to determine the relative preventability of those incidents. GRA

N80-14277# Illinois Univ. at Chicago Circle, Chicago. Dept. of Materials Engineering.
COMPLETE STRESS-STRAIN CURVE OF CONCRETE AND NONLINEAR DESIGN Progress Report
S. H. Ahmad and S. P. Shah Aug. 1979 33 p refs
(Grant NSF PFR-78-22878)
(PB-299151/1) Avail: NTIS HC A03/MF A01 CSCL 13C

Difficulties of experimentally obtaining the descending part of the stress-strain curve of concrete in uniaxial compression and methods of overcoming these difficulties are described. The influence of testing parameters on the stress-strain curves are presented. Based on the experimentally observed stress-strain relationship, an analytical model was developed to predict the moment-curvature relationships of reinforced concrete sections. These moment-curvature relationships are compared with some available experimental data obtained and with those obtained by two other analytical models. GRA

N80-14278# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SURVEY OF SOLIDIFICATION/STABILIZATION TECHNOLOGY FOR HAZARDOUS INDUSTRIAL WASTES Interim Report
Jul. 1979 51 p refs
(PB-299206/3; EPA-600/2-79-056) Avail: NTIS HC A04/MF A01 CSCL 13B

Solidification/stabilization systems for industrial solid wastes are reviewed. The advantages and disadvantages of each approach are discussed. Abstracts from technical information furnished by companies developing or marketing solidification/stabilization processes or marketing equipment specifically for these processes are presented. GRA

N80-14279# General Accounting Office, Washington, D. C. Energy and Minerals Div.
THE SOLAR IN FEDERAL BUILDINGS DEMONSTRATION PROGRAM
10 Aug. 1979 24 p
(PB-298535/6; EMD-79-84) Avail: NTIS HC A02/MF A01 CSCL 13A

Recommendations are presented for DOE to develop a comprehensive strategy and plan for guiding and integrating conservation and solar efforts for Federal buildings in order to implement the Federal buildings solar program on the scale envisioned by the National Energy Plan and the Congress. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

N80-14280 Utah Univ., Salt Lake City.
A CONSTANT PERCENTAGE BANDWIDTH TRANSFORM FOR ACOUSTIC SIGNAL PROCESSING Ph.D. Thesis
James Elden Youngberg 1979 121 p
Avail: Univ. Microfilms Order No. 7924343

A constant percentage bandwidth transform for acoustic signal processing is presented. Such a transform was shown to emulate behavior found in the human auditory system, making possible both the imitation or peripheral auditory analysis, and processing which was more closely linked to perception than is possible using constant bandwidth analysis. A synthesis transformation is developed to enable such processing. Various properties of the transform pair are derived, and a filterbank analogy is used to create a basis for intuitive understanding of the transform's operation and properties. The effects of spectral domain modification are described and shown to be related to the properties of the analysis window function. Principles governing discrete implementation of the transform pair are discussed, and relationships are formalized which specify the sampling of the spectral domain. Dissert. Abstr.

N80-14281* National Aeronautics and Space Administration. Pasadena Office, Calif.
ELECTROMAGNETIC POWER ABSORBER Patent
Richard S. Iwasaki, inventor (to NASA) (JPL) Issued 14 Aug. 1979 6 p Filed 15 Sep. 1977 Continuation of abandoned US Patent Appl. SN-703905, Filed 9 Jul. 1976 Sponsored by NASA
(NASA-Case-NPO-13830-1; US-Patent-4,164,718; US-Patent-Appl-SN-834257; US-Patent-Class-333-81R; US-Patent-Class-343-18A; US-Patent-Class-343-909; US-Patent-Appl-SN-703905) Avail: US Patent and Trademark Office CSCL 20N

A structure is presented with a surface portion of dielectric material which passes electromagnetic radiation and with a portion below the surface which includes material that absorbs the radiation, the face of the structure being formed with numerous steep ridges. The steepness of the dielectric material results in a high proportion of the electromagnetic energy passing through the surface for absorption by the absorbing material under the surface. A backing of aluminum or other highly heat-conductive and reflective material lies under the face and has very steep protuberances supporting the absorbing and dielectric materials. Official Gazette of the U.S. Patent and Trademark Office

N80-14282 Arizona Univ., Tucson.
EXTRAPOLATION TECHNIQUES FOR THE EVALUATION OF DIGITAL COMMUNICATIONS EQUIPMENT Ph.D. Thesis
George Robert Davis 1979 269 p
Avail: Univ. Microfilms Order No. 7927579

A technique which extrapolates the desired information accurately from more readily obtainable data is presented. The

validity of the technique is established both analytically and experimentally. A procedure was discovered for the alignment of digital communications equipment that has potentially greater significance than the reduction of test time. The method is to perform final adjustments on the equipment while monitoring the bit error rate at a very low signal to noise ratio. Although analog alignment techniques are well established and necessary to obtain proper operation, these methods may not produce the best possible operational performance. The experimental results show that final alignment while monitoring bit error rate can produce the desired optimum performance. Dissert. Abstr.

N80-14283 Texas Univ. at Austin.
DISCRETE TIME DETECTION OF SIGNALS IN DEPENDENT NON-GAUSSIAN NOISE Ph.D. Thesis
Don Ray Halverson 1979 144 p
Avail: Univ. Microfilms Order No. 7928299

Several topics are presented within the general area of signal detection theory. Detection of a signal in symmetrically phi-mixing noise is considered. Applying the criterion of asymptotic relative efficiency, design of the optimal memoryless detector is specified and is seen to depend only on second-order statistical knowledge of the noise. It is shown that in many cases this design reduces to approximating the noise process with an m-dependent process, finding the corresponding nonlinearity as a solution to a Fredholm integral equation of the second kind, and obtaining the optimal nonlinearity through a limiting process. Conditions are given for the existence of a unique optimal nonlinearity. A bound on the performance of the optimal phi-mixing detector relative to that of the detector designed under an m-dependent assumption is given. Dissert. Abstr.

N80-14284 Purdue Univ., Lafayette, Ind.
ZINC OXIDE ON SILICON SURFACE ACOUSTIC WAVE CONVOLVERS AND MEMORY CORRELATORS Ph.D. Thesis
Fu-Chang Lo 1979 173 p
Avail: Univ. Microfilms Order No. 7926406

A significant improvement in the signal processing capabilities of metal-zinc oxide-silicon dioxide-silicon (MZOS) memory correlators was achieved by utilizing the high coupling characteristics of the Sezawa wave together with the superior storage characteristics of a pn diode array. A prototype Sezawa wave MZOS pn diode array memory correlator was fabricated and tested. The device displayed a bandwidth capability in excess of that associated with Rayleigh mode MZOS devices. Rayleigh mode MZOS pn diode array correlators were also fabricated and evaluated. A metal insulator semiconductor-oriented analysis for surface acoustic wave convolvers was developed and applied to both the MZOS configuration and the separated medium configuration. The predictions of this theoretical model are compared to alternative theories. Dissert. Abstr.

N80-14285 Tennessee Univ., Knoxville.
CLASSICAL THEORY OF RADIATIVE TRANSITIONS Ph.D. Thesis
John Thomas Freeman Barwick 1979 120 p
Avail: Univ. Microfilms Order No. 7927025

Schroedinger's original conception of the connection between the electric field and the wave function is reinterpreted and extended. The semiclassical approach to radiative transitions is based on the exact description of a particle undergoing a transition between two energy eigenstates. The physical existence of such a wave function during a transition allows for a simple classical explanation of the origin of radiation from quantum mechanical systems, both in the usual bound state cases and in some free particle transitions for which there have been no semiclassical accounts. The Compton effect is given a classical explanation which yields the Klein-Nishina cross section and demonstrates the classical origin of photon-like behavior of the incident and scattered radiation. Further confirmation of the classical nature of the electromagnetic field at the quantum mechanical level is presented in a derivation of the Lamb shift. A more complete discussion of the c sub 1(t) and c sub 2(t) transition coefficients is also carried out, leading to semi-classical treatments of spontaneous emission and the blackbody spectrum.

Dissert. Abstr.

N80-14286 British Broadcasting Corp., Kingswood (England). Engineering Div.
GROUND-WAVE PROPAGATION IN A REALISTIC TERRAIN
J. H. Causebrook Oct. 1979 19 p refs
(BBC-RD-1979/19) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Results of investigations into ground wave propagation in a realistic terrain are presented. The differences between wave propagation over a smooth terrain versus a realistic one, include a nonsimple relationship for field variation with distance, and a nonfree space relationship between electric and magnetic fields. The theory of why these occur is summarized and the measurements taken to demonstrate their nature are given. Also, descriptions are given of a computer calculation method which was developed in this research. M.M.M.

N80-14287 British Broadcasting Corp., Kingswood (England). Engineering Div.
LOCAL OSCILLATOR RADIATION FROM TELEVISION RECEIVERS
J. Middleton Nov. 1979 11 p refs
(BBC-RD-1979/21) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The ways in which local oscillator interference becomes apparent is examined along with recent measurements made to determine whether there has been any reduction in the level of radiation from modern receivers. It was concluded that there was no significant reduction. M.M.M.

N80-14288# Communications Research Centre, Ottawa (Ontario). Radio and Radar Research Branch.
VHF AND UHF PROPAGATION STUDIES IN THE CANADIAN ARCTIC
F. H. Palmer Oct. 1979 28 p refs
(CRC-1327) Avail: NTIS HC A03/MF A01

Measurements of path loss for various frequencies, polarizations, and transmitting and receiving antenna heights, were made at a number of receiving sites along several radials from each transmitter. Path lengths ranged from 1 to 100 km and covered land, water, and mixed types of terrain. The measurements were used to construct empirical models of path loss for these areas, and to form a data base with which to compare the predictions of the CRC VHF/UHF propagation prediction computer program. The measurement program and the empirical models which were derived from the results are described. M.M.M.

N80-14289*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RESONANT FREQUENCY OF MICROSTRIP ANTENNAS CALCULATED FROM TE-EXCITATION OF AN INFINITE STRIP EMBEDDED IN A GROUNDED DIELECTRIC SLAB
M. C. Bailey Nov. 1979 18 p refs
(NASA-TM-80190) Avail: NTIS HC A02/MF A02 CSCL 20N

The calculation of currents induced by a plane wave normally incident upon an infinite strip embedded in a grounded dielectric slab is used to infer the resonant width (or frequency) of rectangular microstrip antennas. By placing the strip inside the dielectric, the effect of a dielectric cover of the same material as the substrate can be included in the calculation of resonant frequency. A comparison with measured results indicated agreement of 1 percent or better for rectangular microstrip antennas constructed on Teflon-fiberglass substrate. Author

N80-14290*# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
HIGH FREQUENCY SCATTERING FROM A THIN LOSSLESS DIELECTRIC SLAB M.S. Thesis
K. W. Burgener Nov. 1979 77 p
(Grant NsG-1498)
(NASA-CR-162564; OSU-TR-710964-4) Avail: NTIS HC A05/MF A01 CSCL 20N

A solution for scattering from a thin dielectric slab is developed based on geometrical optics and the geometrical theory of diffraction with the intention of developing a model for a windshield of a small private aircraft for incorporation in an aircraft antenna code. Results of the theory are compared with experimental

measurements and moment method calculations showing good agreement. Application of the solution is also addressed. M.G.

N80-14291# Fondazione Ugo Bordoni, Rome (Italy).
RESEARCH ON CIRCULAR WAVEGUIDE COMMUNICATION SYSTEMS Progress Report, 1968 - 1977 [RICERCHE SUI SISTEMI DI COMMUNICAZIONE IN GUIDA D'ONDA CIRCLARE]
Nov. 1978 436 p refs Partly in ITALIAN and ENGLISH (FUB-28) Avail: NTIS HC A19/MF A01

The Italian research program on circular waveguide systems is described. The program is aimed to provide theoretical and experimental results about feasibility, performance and cost of the transmission media, of the methods, of the regenerative repeaters and terminal equipment, and of the complete communication system. The reported results include the development of regenerative repeaters, the design of special circular waveguides and accessories, and various experimental measurements of equipment performance. For individual titles, see N80-14292 through N80-14301.

N80-14292# Fondazione Ugo Bordoni, Rome (Italy).
ITALIAN RESEARCH ON MILLIMETRIC WAVEGUIDE SYSTEMS
Renato Kock *In its* Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 15-19 Presented at Intern. Conf. on Millimetric Waveguide Systems, London, Nov. 1976 (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The Italian research program on circular millimetric waveguide systems is reviewed, including the description of equipment, repeater performances, waveguide trunk design, and experimental investigation on waveguides. The history of the 'Millimetric Wave Center' near Bologna, where much of the research was conducted, is detailed. Author (ESA)

N80-14293# Politecnico di Milano (Italy).
GENERAL CONSIDERATIONS ABOUT CIRCULAR WAVEGUIDE SYSTEMS [CONSIDERAZIONI GENERALI SUI SISTEMI IN GUIDA D'ONDA CIRCOLARE]
Giovanni B. Stracca and Francesco Valdoni (Bologna Univ.) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 23-54 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The systems engineering approach to circular waveguide systems is discussed. In particular the quality limitations and the extended attenuation bandwidth effects are analyzed, and these are referred to long distance digital communication networks. Feasibility and cost of such systems are examined, giving criteria for the technical and economical design optimization.
Author (ESA)

N80-14294# Bologna Univ. (Italy).
PROPAGATION IN CIRCULAR WAVEGUIDES [PROPAGAZIONE IN GUIDA D'ONDA CIRCOLARE]
Gian Carlo Corazza and Gabriele Falciasecca *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 57-85 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The general method for determination of electromagnetic fields guided by metallic cylindrical structures is reviewed and applied to TE01 propagation in circular waveguides. The design criteria of propagation media are derived from the non-infinite conductivity of metallic walls and the propagation deformation effects on the TE01 mode. The effects of multi-mode propagation are discussed presenting a simplified model based on ... coupled mode propagation equations, and the influence of curves and deformations are examined. The distortion and noise increase produced by mode reconversion are analyzed. Author (ESA)

N80-14295# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy). Elettronica S.p.A.
DESIGN OF THE TRANSMISSION MEDIA OF CIRCULAR WAVEGUIDES [PROGETTO DEL MEZZO TRASMISSIVO DI SISTEMI IN GUIDA D'ONDA CIRCOLARE]
Paolo Bernardi, Gabriele Falciasecca (Bologna Univ.), and Sergio Rogai (Ente Nazionale per l'Energia Electricca) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 89-167 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The computer program PAGOM used for the design of circular waveguides is described and the design criteria adopted in preparing that program are explained. The PAGOM program is presented in two versions, one for the design analysis and another for automatic design. Results obtained in both cases illustrate the method potential. The characteristics of the resulting practical waveguide structures and the processes created for its production are summarized. Author (ESA)

N80-14296# Trieste Univ. (Italy).
GENERAL CRITERIA FOR THE DESIGN OF REPEATING STATIONS OF CIRCULAR WAVEGUIDE SYSTEMS [CRITERI GENERALI PER IL PROGETTO DELLA STAZIONE RIPETITRICE DI SISTEMI IN GUIDA D'ONDA CIRCOLARE]
Edoardo Carli, Tullio Corzani, and Giovanni B. Stracca (Politech. di Milan) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 171-270 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

Considerations made before starting a circular waveguide repeating stations project are discussed. The analysis include subjects such as: the selection criteria of repeater main parameters, the selection of the overall bandwidth and frequencies, the characteristics of the channel system, a comparison between channel distributions proposed by various administrations, the branch filter systems, the band filter systems, the selection criteria of the modulation type, the repeater structure, the selection of intermediate frequency, the transmission power, and equalizers.
Author (ESA)

N80-14297# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy). Elettronica S.P.A.
SPECIAL PASSIVE COMPONENTS FOR CIRCULAR WAVEGUIDES [COMPONENTI SPECIALI PASSIVI IN GUIDA D'ONDA CIRCOLARE]
Paolo Bernardi and Franco Bertolani (Fond. Ugo Bordoni) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 273-298 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The working principle and design basis of special passive components for circular waveguide links are described. The characteristics and performance tests of some of these components, which were built as prototypes, are presented, including a directional coupler between rectangular and circular waveguides, diameter adapters (tapers), small radius curves, quasi-optical elbows, mode filters and dilation joints. Author (ESA)

N80-14298# Bologna Univ. (Italy).
PROBLEMS AND INSTALLATION TECHNIQUE OF THE TRANSMITTING MEDIA OF A CIRCULAR WAVEGUIDE LINK [PROBLEMI E TECHNICHE DI INSTALLAZIONE DEL MEZZO TRASMISSIVO DI UN COLLEGAMENTO IN GUIDA D'ONDA CIRCOLARE]
Gian Carlo Corazza, Luigi Lo Vecchio (Fond. Ugo Bordoni), and Guido Magni (SIRTI) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 301-340 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

An experimental installation of a circular waveguide line was made at Ozzano (Emilia-Italy) to characterize and evaluate various commercial waveguide types and to study the installation techniques. A straight line (402 m) section and a large radius curve (215 m) section are provided. The auxiliary equipment and the installation techniques are described. Power spectra, equivalent curvature and alternation measurements are given. It is concluded that the experimental industrial-type installation procedure presents acceptable results as compared to a laser aligned installation, although an evaluation extended to several tenths of a kilometer is advisable. Author (ESA)

N80-14299# Bologna Univ. (Italy).
MEASUREMENT AND CHARACTERIZATION OF MANUFACTURING AND INSTALLATION IMPERFECTIONS OF CIRCULAR WAVEGUIDES [MISURE E CARATTERIZZAZIONE DELLE IMPERFEZIONI DI COSTRUZIONE E DI POSA DELLA GUIDA D'ONDA CIRCOLARE]
Gabriele Falciasecca, Luigi Lo Vecchio (Fond. Ugo Bordoni), and Guido Magni (SIRTI) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 343-367 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

Geometric deformations of circular waveguides influencing the mode conversion are analyzed. The criteria for test bench design, adapted to characterize TE01 mode propagation, are given. Test benches actually built and the characterization results of some waveguides are described. The similarity with the measuring systems independently developed in France and the United States is stressed. Author (ESA)

N80-14300# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).
MEASURING METHODS OF THE ELECTROMAGNETIC CHARACTERISTICS OF CIRCULAR WAVEGUIDES [METODI DI MISURA DELLE CARATTERISTICHE ELETTROMAGNETICHE DELLA GUIDA D'ONDA CIRCOLARE]
Paolo Bernardi, Franco Bertolani (Fond. Ugo Bordoni), and Francesco Valdoni (Bologna Univ.) *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 371-398 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The tests benches for circular waveguide characterization are analyzed and the measuring systems already built, with corresponding practical examples, are described. The methods being examined include: measurement of the TE01 mode attenuation by resonance methods and by multiple echo methods; measurement of the propagation constant of undesirable modes by the substitution method and by the phase constant difference; measurement of mode conversion by a resonance method and by double resonance; link measurement by pulse echometry and by substitution with superheterodyne reception. Author (ESA)

N80-14301# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).
MEASURING METHODS OF REPEATER CHARACTERISTICS FOR CIRCULAR WAVEGUIDE SYSTEMS [METODI DI MISURA DELLE CARATTERISTICHE DI APPARECCHIATURE RIPETITRICI PER SISTEMI IN GUIDA D'ONDA CIRCOLARE]
Luciano Buti *In* Fond. Ugo Bordoni Res. on Circ. Waveguide Commun. Systems Nov. 1978 p 401-425 refs In ITALIAN (For primary document see N80-14291 05-32)
Avail: NTIS HC A19/MF A01

The main characteristics of transmitter, receiver, connection network and phase equalizer of repeater apparatus are examined and appropriate measuring methods are presented. The group delay, the error rate and the insertion loss measurements, are considered in particular, presenting the experimental results in chart form to illustrate these methods. Author (ESA)

N80-14302# Decision-Science Applications, Inc., Arlington, Va.
A MODEL FOR SPACE RADAR CLUTTER Final Report, 15 Feb. 1978 - 15 Feb. 1979
P. G. Tomlinson Griffiss AFB, N.Y. RADC, Griffiss AFB, N.Y. Jun. 1979 107 p refs
(Contract F30602-78-C-0129; AF Proj. 4506)
(AD-A072990; DSA-116; RADC-TR-79-166) Avail: NTIS HC A06/MF A03 CSCL 17/9

A model for radar clutter as encountered from a space-based platform is developed. Included in the model are land, sea and airborne clutter with emphasis on land clutter. Parametric fits to existing reflectivity data are performed for seven generic terrain types: desert, forest, mountain, rural, urban, snow and ice and sea. The fits are parametric in frequency and grazing angle and, in the case of sea clutter, polarization. In addition to the mean values of clutter reflectivity, the variation about the mean is emphasized. The underlying causes of clutter variability nonhomogeneous terrain type, terrain undulation, etc., are discussed. Quantitative estimates of their effects are presented. A theory of probability density function of clutter based on the resolution cell size, correlation lengths, and underlying statistics of individual scatterers, is presented. Examples are worked out for five terrain types and a large resolution cell. The results are threshold settings required for given false alarm probabilities. Clutter spectra are discussed briefly. Finally, requirements and computer simulations are examined with particular attention to the advantages and disadvantages of three candidate measurement programs. GRA

N80-14303# Logicon, Inc., San Diego, Calif. Tactical and Training Systems Div.
VOCABULARY SPECIFICATION FOR AUTOMATIC SPEECH RECOGNITION IN AIRCRAFT COCKPITS Final Report, Sep. 1978 - Jun. 1979
Rohn J. Petersen, Nancey Lee, Catherine Meyn, Elaine Regelson, and William Satzer 31 Aug. 1979 92 p refs
(Contract N00014-78-C-0692)
(AD-A073703) Avail: NTIS HC A05/MF A01 CSCL 17/2

The general focus of this research was to design a communication media (a vocabulary) that is advantageous to both machine recognition and human production of speech events. The problem was analyzed from a human factors perspective that centered upon the man-computer dialogue (interaction) required for cockpit application of ASR. The results indicated that phrase familiarity and stimulus familiarity had major impact on the learning and utilization of the phrases in the paired-associate task. Phrase length and meaningfulness did not appear to differentially affect either the learning or utilization of the paired associate. In addition, pretraining of stimulus familiarity did not seem to result in improved performance. Acoustic lexical confusability also was discussed in general methodological terms. The results of the study were interpreted in terms of a contextualist viewpoint with the necessity of a broader contextual manipulation being pointed out as a requirement for further research. GRA

N80-14304# Naval Research Lab., Washington, D. C.
MAXIMUM ENTROPY WAVENUMBER ANALYSIS Interim Report
William R. King 20 Mar. 1979 39 p refs
(RR0210541)
(AD-A073290; AD-E000311; NRL-8298) Avail: NTIS HC A03/MF A01 CSCL 20/14

The maximum entropy spectral analysis (MESA) technique is applied to a linear spatial array of sensors to obtain wavenumber power spectra. The resultant wavenumber spectra are compared with conventional beamsteered antenna patterns using simulated signals mixed with Gaussian noise. The results indicate that the MESA technique, which is an all-pole model, may provide improved accuracy and improved spatial resolution of signals under varying signal-to-noise conditions. Some difficulties with MESA are noted, and further investigations are recommended. GRA

N80-14305# Computer Sciences Corp., Falls Church, Va.
EARTH TERMINAL SUBSYSTEM STUDY. VOLUME 1: SMALL TERMINAL COST ANALYSIS Final Report
Ross Winebarger May 1979 51 p Prepared by Harris Corp., Melbourne, Fla.
(Contract DCA100-76-C-0089)
(AD-A073429; AD-E100271) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report addresses the cost sensitivities of the major components of a small economical earth terminal. A baseline X-band terminal is proposed which has a G/T of 20 dB and an EIRP of 72 dBW. Parametric curves are developed which show the changes in hardware cost corresponding to moderate changes in component characteristics around the baseline values. Parametric cost curves are developed for changes in the antenna diameter, RMS surface accuracy, antenna efficiency, antenna wind performance, transmitter power, type of low-noise amplifier, oscillator stability, and phase noise performance. Cost data is then developed and presented for changes in the terminal G/T, EIRP, and availability around the baseline terminal performance. GRA

N80-14306# Computer Sciences Corp., Falls Church, Va.
EARTH TERMINAL SUBSYSTEM STUDY. VOLUME 4: TRANSMITTER COMBINING FOR SIMULTANEOUS TRANSMISSION OF FDMA AND TDMA CARRIERS Final Report

Ross Winebarger May 1979 40 p Prepared by Harris Corp., Melbourne, Fla.
(Contract DCA100-76-C-0089)
(AD-A073356; AD-E100272) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report addresses alternative methods of combining high-power TDMA and FDMA X-band carriers for simultaneous transmission from Defense Satellite Communications System (DSCS) earth terminals. The TDMA signal is assumed to be in Channel 1 of the DSCS III frequency plan, with the FDMA carriers in Channels 2 and 6 (on both sides of the TDMA signal). Three alternative diplexer configurations are described: (1) a conventional bandpass filter; (2) a band-stop filter; and (3) a dual E-stub filter. The three configurations are evaluated in terms of insertion loss, phase linearity, and complexity. It is concluded that the bandpass filter approach is the preferred approach, based on its low-loss characteristics and its design simplicity. GRA

N80-14307# Ohio State Univ., Columbus. Electroscience Lab.
COMMUNICATION APPLICATION OF ADAPTIVE ARRAYS Quarterly Report
R. T. Compton, Jr. Jun. 1979 7 p ref
(Contract N00019-79-C-0291)
(AD-A074558; ESL-711847-1) Avail: NTIS HC A02/MF A01 CSCL 17/2

Adaptive arrays for communication applications are summarized. Weight jitter and dynamics for improved lunar excursion module mission simulator loop were studied. A reference signal generation technique for frequency shift keying signals was investigated. A monograph on adaptive arrays was prepared. R.C.T.

N80-14308# Naval Ocean Systems Center, San Diego, Calif.
IMAGE TRANSMISSION VIA SPREAD SPECTRUM TECHNIQUES Annual Report, Jan. - Dec. 1977
E. H. Wrench and A. G. Weber 1 Jan. 1978 412 p
(DARPA Order 2303)
(AD-A074606; GIDEP-E123-0600; ARPA-QR8) Avail: NTIS HC A18/MF A01 CSCL 17/2

This report summarizes the work performed on the Image Bandwidth Reduction Program for ARPA by the Naval Ocean Systems Center during calendar year 1977. Appendices A through I detail the work done, both in-house and under contract. Topics covered include Bandwidth Reduction System, Command Language Summary, Frame-Store Memory Executive Program, Derivation of the Fast Cosine Transform, Human Factors Involved With Viewing Compressed Images From Remote Piloted Vehicles, Coding Techniques For RPV and SAR Images, Image Coding Techniques, Stochastic Image Models and Hybrid Coding, and Operator Performance Evaluation of Mini-RPV Video Image Bandwidth Reduction/Compression Techniques. GRA

N80-14309# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPEECH ENHANCEMENT USING A SOFT-DECISION MAXIMUM LIKELIHOOD NOISE SUPPRESSION FILTER
Robert J. McAulay and Marilyn L. Malpass 19 Jun. 1979 40 p refs
(Contract F19628-78-C-0002)
(AD-A074082; TN-1979-31; ESD-TR-79-163) Avail: NTIS HC A03/MF A01 CSCL 17/2

One way of enhancing speech in an additive acoustic noise environment is to perform a spectral decomposition of a frame of noisy speech and to attenuate a particular spectral line depending on how much the measured speech plus noise power exceeds an estimate of the background noise. Using a two state model for the speech event (speech absent or speech present) and determining the maximum likelihood estimator of the speech power results in a new class of suppression curves which permits a tradeoff of noise suppression against speech distortion. The algorithm has been implemented in real time in the time domain, exploiting the structure of the channel vocoder. Extensive testing has shown that the noise can be made imperceptible by proper choice of the suppression factor. GRA

N80-14310# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CAPACITY ALLOCATION TECHNIQUES IN A MULTI-USER SATELLITE SYSTEM
John I. Capetanakis 18 Jul. 1979 38 p refs
(Contract F19628-78-C-0002; AF Proj. 2029)
(AD-A074018; TN-1979-34; ESD-TR-79-185) Avail: NTIS HC A03/MF A01 CSCL 17/2

The multiple accessing of satellite by a large number of independent users is considered. The messages are generated randomly, and they are of fixed length. Depending on the accessing protocol, such a system may exhibit congestion instabilities, long message delays, or low throughput. Several important protocols (that are applicable to such a system and which fall into the categories of direct access, reservation access, and polling access) are presented and evaluated. The E (delay) vs E (throughput) performances of the various protocols are obtained and compared. It is shown (for a specific example) that demand assignment access with a TREE reservation protocol is best for throughput up to about 70%, whereas polling access is best in heavier message traffic. GRA

N80-14311# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering.
ROBUST WAVEFORM DESIGN Final Report
H. L. Weinert and Abdel-Rahman H. El-Sawy Sep. 1978 47 p refs
(Contract N00014-77-C-0617; NRL Proj. R02-105)
(AD-A074932) Avail: NTIS HC A03/MF A01 CSCL 17/2

A test-bed package, Detector Performance Evaluation (DPE), designed to evaluate the performance of a wide class of detectors for different signal waveforms against arbitrary noise distributions is presented. R.E.S.

N80-14312# GTE Sylvania, Inc., Needham Heights, Mass. Electronics Systems Group.
SUBBAND CODER STUDY Final Report
Ronald S. Cheung and Raimond L. Winslow 2 Jul. 1979 128 p refs
(Contract DCA100-79-C-0001)
(AD-A074427; AD-E100278) Avail: NTIS HC A07/MF A01 CSCL 17/2

This report gives a detailed treatment of the theory and implementation of a speech waveform coding technique known as subband coders whose operations include the partitioning of the input speech band into subbands and the quantization of subbands individually. Both the integer-band sampling and the quadrature mirror filtering (QMF) approaches are studied and the result indicates that the latter method yields much improved speech quality as compared to the former one. In addition to the design of bandpass filters and subband quantizers, practical aspects in the implementation of subband coders are considered and they include (1) a more efficient digital interpolation scheme, and (2) a high speed multiplier-accumulator. GRA

N80-14313# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
AFOSR WORKSHOP IN COMMUNICATION THEORY AND APPLICATIONS Final Report
P. Papantoni-Kazakos 20 Aug. 1979 147 p refs Workshop held at Provincetown, Mass., 17-20 Sep. 1978
(Grant AF-AFOSR-3715-78; AF Proj. 2304)
(AD-A074298; AFOSR-79-0955TR) Avail: NTIS HC A07/MF A01 CSCL 17/2

A workshop in communication theory and applications was held. There were 6 papers on stochastic processes related to communication problems. Six papers were presented on the subject of source coding. Five papers were presented on topics in statistical pattern recognition. Seven papers were presented in communication theory. Five papers were presented on computer networks. Six papers were presented on spread-spectrum multiple-access communications. Finally, five papers were presented on adaptive equalizers. GRA

N80-14314# California Univ., Los Angeles. Dept. of System Science.
ERROR CONTROL SYSTEMS FOR MULTI-ACCESS COMMUNICATION CHANNELS
Billy Hitoshi Saeki and Izhak Rubin Jun. 1979 292 p refs

(Contract N00014-75-C-0809; N00014-78-C-0778; Grant NSF ENG-77-20799; NR Proj. 042-291)
(AD-A074569; UCLA-ENG-7937) Avail: NTIS HC A13/MF A01 CSCL 17/2

Error control systems for multi access communication channels are investigated. Error detection and retransmission techniques, also referred to as automatic request repeat (ARQ) schemes, are integrated with basic channel access control disciplines. The channel access disciplines coordinate the transmissions by the distributed stations of the communication network to avoid simultaneous transmissions over the shared channel. The automatic request repeat system provides the necessary error recovery procedures to insure data transmission integrity. Automatic request repeat error control systems are applied to a multi access broadcast channel governed by a time division multiple access, a group random access (GRA), channel access control disciplines, a fixed scheduling discipline and a random access discipline, respectively. The TDMA channel is examined under Select and Repeat, Block, and Stop and Wait ARQ schemes. The GRA channel is investigated under acknowledgment schemes which either schedule acknowledgment transmissions or transmit acknowledgments on a random access basis. Author

N80-14315# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SPEECH COMPRESSION AND SYNTHESIS Annual Report, 6 Apr. 1978 - 7 Jun. 1979
Michael Berouti, Lynn Cosell, John Klovstad, John Makhoul, and Richard Schwartz Aug. 1979 114 p refs
(Contract F19628-78-C-0136; ARPA Order 3515)
(AD-A074497; BBN-4159) Avail: NTIS HC A06/MF A01 CSCL 17/2

This report describes our work for the past year on speech compression and synthesis. A real-time variable-frame-rate LPC vocoder operating was implemented at an average rate of 2000 bits/s. Mixed-source model as part of the vocoder was also tested. To improve the reliability of the extraction of LPC parameters, a range of adaptive lattice and autocorrelation algorithms was implemented and tested. For data rates above 5000 bits/s, a new high-frequency regeneration techinque, spectral duplication, was developed and testad which reduces the roughness in the synthetic speech. As part of an overall very-low-rate speech compression system, a program was designed and implemented for phonetic synthesis from diphone templates. The lengthy process of extracting the 3000 needed diphone templates has been half completed. GRA

N80-14316# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A NEW CLASS OF OPTICAL COMMUNICATION SYSTEMS. 1: EXPERIMENT
Paul H. Deitz, Gary L. Durfee, and Stephen S. Wolff Jul. 1979 26 p refs
(AD-A074313; AD-E430294; ARBRL-MR-02930) Avail: NTIS HC A03/MF A01 CSCL 17/2

A new class of optical communication schemes is described in which a message is coded spatially in a random phase process and detected at many points at the receiver. This process may be termed a spatial-multiplex, spatial-diversity optical communication scheme. The technique shows relative immunity to the effects of atmospheric turbulence. Also, relative security of the method is assured since detection can take place only when radiation is detected and processed at many points within the beam itself. GRA

N80-14317# Rome Air Development Center, Griffiss AFB, N.Y.
VLF/LF REFLECTIVITY OF THE POLAR IONOSPHERE, 3 SEPTEMBER - 30 DECEMBER 1978
Robert P. Pagliarulo, John P. Turtle, John E. Rasmussen, Robert L. Cooley, and Wayne Klemetti (Megapulse, Inc., Bedford, Maine) May 1979 83 p refs
(AF Proj. 4600)
(AD-A074475; RADC-TR-79-178) Avail: NTIS HC A05/MF A01 CSCL 20/14

This report provides a summary of high latitude ionospheric reflectivity as observed by the USAF high resolution VLF/LF ionosounder operating in northern Greenland. Ionospheric reflectivity parameters, including reflection heights and coefficients, are presented as a function of time of day. VLF long path propagation measurements, along with magnetometer and riometer data, are presented as supplementary data. GRA

N80-14318# Oregon State Univ., Corvallis. Dept. of Electrical and Computer Engineering.
SIMULATION OF COMMUNICATIONS PROTOCOLS FOR A TACTICAL RADAR NETWORK. PART 1: EXECUTIVE SUMMARY Final Report
C. J. Warner and J. D. Spragins 13 Aug. 1979 79 p
(Grant AF-AFOSR-3619-78; AF Proj. 2304)
(AD-A074157; AFOSR-79-0985TR) Avail: NTIS HC A05/MF A01 CSCL 17/9

An advanced forward area tactical radar network is now under conceptual development by the Air Force Electronic Systems Division. The proposed network will link together a number of short range radars, each with associated data processing equipment, so that each radar site has a complete file of tracks for all targets seen by any radar in the network. In addition, the communication network is expected to be used for transmission of a variety of other types of command and control messages. A new class of adaptive routing protocols for computer communication networks has been developed in this research using the radar network as a basis. These new routing protocols utilize new techniques for searching out and using both reciprocal paths over which messages can travel in either direction and non-reciprocal paths over which messages can travel in only one direction for directed message routing. A general process simulation system simulation model of a thirteen node radar network was used to determine the transient characteristics of the new routing protocols while adapting to various cases of network damage. Significant results are reported. Author

N80-14319# Colorado Univ., Boulder.
A GENERALIZED SIDELOBE CANCELLING STRUCTURE FOR ADAPTIVE ARRAYS Technical Report, 1 Apr. 1977 - 31 Mar. 1978
Lloyd J. Griffiths and Charles W. Jim Nov. 1978 53 p refs
Prepared for SRI Intern. Corp., Menlo Park, Calif.
(Contract N00014-75-C-0930; NR Proj. 088-076)
(AD-A074899; CU-SPL-78-2) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report introduces a new formulation, termed generalized sidelobe cancelling (GSC), for adaptive arrays. This formulation offers an alternative method or implementing older adaptive structures, as well as a method usable in formulating a new, wider class of adaptive beamformers. The GSC approach provides an implementation advantage in that the conventional beamformer is separated out as a distinct element in the overall processor. In addition, the linear constraints which ensure the absence of distortion in the main array lobe can be implemented as simple analog hardware elements. This approach is in contrast to previous approaches in which the constraints have been incorporated into the adaptive algorithm. Another advantage of the GSC formulation is that it clearly delineates the similarities and differences between P-vector and linearly constrained adaptive beamforming. To assess further the performance characteristics of adaptive processing of HF radar data, the GSC beamformer was used to study data collected at the Wide Aperture Research Facility operated by SRI International. Findings of this study are included. GRA

N80-14320# California Univ., Berkeley. Electronics Research Lab.
ANTENNA-COUPLED INFRARED DETECTORS Final Report
S. E. Schwarz 14 Jun. 1979 8 p
(Grant DAAG29-76-G-0284)
(AD-A074085; ARO-13770.6-EL) Avail: NTIS HC A02/MF A01 CSCL 17/5

Planar sub-millimeter and near-millimeter antennas have been studied. These antennas are suitable for integration with mixer diodes and infrared detectors. Antenna-coupled microbolometer far-infrared detectors have been built. These offer an advantageous combination of room-temperature operation, detectivity, and speed. Integrated antenna-coupled Schottky diode mixers are being developed. GRA

N80-14321# Rome Air Development Center, Griffiss AFB, N.Y.
GROUND-BASED PROPAGATION MEASUREMENTS IN SUPPORT OF FLIGHT EVALUATION OF THE E-3A OMEGA NAVIGATION SYSTEM, JUNE - NOVEMBER 1976
Paul A. Kossey, John E. Rasmussen, John P. Turtle, Robert P. Pagliarulo, and Charles B. Kalakowsky Feb. 1979 57 p
(AF Proj. 4600)
(AD-A074474; RADC-TR-79-61) Avail: NTIS HC A04/MF A01 CSCL 17/7

A summary is provided of ground-based propagation measurements made in conjunction with flight tests of the Air Force's E-3A aircraft OMEGA navigation system. Atmospheric noise data at 10.6 kHz and the signal strengths and time differences of OMEGA transmissions from Hawaii, Japan, and North Dakota are described, as recorded at Vandenberg AFB, California, and Almira, Washington, during the period of June - November 1976. GRA

N80-14322# Naval Postgraduate School, Monterey, Calif.
TECHNIQUES AND BENEFITS OF SHAPING THE PULSES OF BINARY SEQUENCES WITH APPLICATION TO SPREAD SPECTRUM RADIO COMMUNICATIONS M.S. Thesis
Panayiotis G. Mavraganis Mar. 1979 153 p refs
(AD-A073964) Avail: NTIS HC A08/MF A01 CSCL 17/2

This research is concerned with binary sequences. Such two-level voltage waveforms are used in some types of spread spectrum systems. Of interest in this work is the effect of shaping the normally rectangular pulses of the binary sequence. An objective is to find and tabulate particular sequences and specific shapes having desirable autocorrelation functions and power spectra. A direct and versatile method of shaping binary sequences is presented. Photographs of sequences having triangular, raised sine and ramp shapes are included in the report. Photographs of the autocorrelation function and spectra of selected shaped sequences are presented. The computer programs used to search for sequences of interest and used to calculate the autocorrelation function and spectra of particular shaped sequences are described. Shaped sequences having interesting spectra were discovered. For example, some spectra have very small side lobe levels; others have no discernible nulls in the spectra; some spectra have nulls which are not simply related to the sequence clock frequency (pulse rate). GRA

N80-14323# Harris Corp., Melbourne, Fla. Electronic Systems Div.
LINEAR MODULATION TECHNIQUES FOR DIGITAL MICROWAVE Final Report, Mar. 1977 - Nov. 1978
Robert C. Davis Griffiss AFB, N.Y. RADC Aug. 1979 334 p
(Contract F30602-77-C-0039; AF Proj. 4519)
(AD-A074047; RADC-TR-79-56) Avail: NTIS HC A15/MF A01 CSCL 17/2

The objective of this program was to study and develop modulation techniques and implementation methods applicable to a linear digital microwave radio operating in the 4 and 8 GHz frequency bands. Modulation techniques capable of providing 3 to 4.5 bits/sec/Hz under the FCC Docket 19311 spectral criterion are developed and included herein. Techniques for the practical implementation of spectrally efficient linear modulation (AM-PM) signal designs in conjunction with presently available microwave power amplifiers are developed. An adaptive predistortion technique for linearizing nonlinear power amplifiers (e.g., TWT's) for the purpose of counteracting AM/AM and AM/PM conversion effects is presented which is useful for linear digital signal designs. A new baseband adaptive equalization scheme which is suited to high rate digital modems is presented. M-ary Quadrature Amplitude Modulation (M-QAM) is chosen as the most efficient scheme for obtaining 3 to 5 bits/sec/Hz under FCC Docket 19311. Waveguide filtering is used to provide FCC Docket 19311 compliance with the M-QAM schemes. An error correction coding/decoding strategy which is applicable to M-QAM signal formats is presented. On the theoretical side, techniques for determining spectral and prformance properties for constrained bandwidth digital signaling are discussed. GRA

N80-14324# Polytechnic Inst. of New York. Dept. of Electrical Engineering and Electrophysics.
SUPPRESSION OF INTERCHANNEL INTERFERENCE IN FM RECEIVERS Final Report, 30 Sep. 1977 - 29 Jun. 1979
Frank A. Cassara and Harry Schachter Jul. 1979 72 p refs
(Grant DAAG29-77-G-0232)
(AD-A074485; Poly-EE79-056; ARO-14941.1-EL) Avail: NTIS HC A04/MF A01 CSCL 17/2

In this work an FM detector capable of suppressing the degradation in receiver performance due to the presence of an interfering signal is presented. Optimum receiver structures based on maximum a-posteriori estimation procedures are first theoretically derived and then a practical demodulator based on the optimum receivers is examined. The receiver consists of two phase-locked loops (PLL) cross coupled in such a manner as to permit one PLL to lock on to and track the stronger received FM signal while the other loop tracks the weaker of the two received FM signals. The detector has the capability of demodulating both the desired received FM as well as the interferer even for the case when both signals are co-channel. Experimental results demonstrating such capability even in the presence of strong input Gaussian noise are presented along with a computer simulation study examining the transient acquisition behavior of the cross coupled PLL receiver structure. GRA

N80-14325# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
TARGET TRACKING USING DOPPLER-INFORMATION IN SENSOR ORIENTED COORDINATES WITH A THREE DIMENSIONAL ARRAY RADAR
G. vanKeuk Aug. 1978 33 p refs In GERMAN; ENGLISH summary
(Rept-270) Avail: NTIS HC A03/MF A01

Measurement statistics, expressed in three dimensional radar oriented coordinates, and the nonlinear equations of target motion are presented. An extended Kalman filter was developed to solve the problem of automatic target tracking. It consists of three decoupled filters, one of which processes Doppler information directly. Depending on target speed, distance, and flight direction of the object being tracked, the domain of applicability for the proposed method is derived. Doppler information is then used to improve the plot to track correlation. It is shown that this information is very sensitive for detecting target maneuvers in an adaptive tracing mechanism.
Author (ESA)

N80-14326# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
ADAPTIVE EQUALIZATION OF DELAY DISTORTED SIGNALS
K. Rosenbach Dec. 1978 50 p refs In GERMAN; ENGLISH summary
(Contract BMVg-GF-78)
(Rept-13-78) Avail: NTIS HC A03/MF A01

The equalization of delay distorted signals through the use of transversal filters is discussed. The advantages and disadvantages of FIR (finite impulse response) and IIR (infinite impulse response) filters are described. A combined FIR/IIR filter which contains the advantages of both filters is described. The problem of adaptive equalization of time variable transmission channels including unkown transmission signals is discussed. The necessary minimum filter length for practical applications is reported. The transient behavior of the filter parameters is computed. A comparison of the theoretical results with the measured transient behavior of an actual filter and with a computer simulated filter is presented. Author (ESA)

N80-14327# European Space Research and Technology Center, Noordwijk (Netherlands). Space Communications Div.
S + S/X BANDS COHERENT TRANSPONDER SPECIFICATION
Paris ESA Mar. 1979 84 p
(ESA-PSS-48(TTC.C.10)-Issue-1) Avail: NTIS HC A05/MF A01

A design requirement standard, related to the telemetry, tracking, command, and data handling standards of the European Space Agency (ESA), is presented. A class of S and S/X bands TTC and ranging transponders which will find increasing application on future ESA spacecraft is described. Since these spacecraft will impose different requirements on the transponder (frequencies, modulation schemes, etc.), a modular construction allowing maximum flexibility and reuse of the same fundamental hardware

in a succession of programs, without major costs for modification, is emphasized. The transponder in its various versions is to be fully compatible with ESA and NASA ground networks.
Author (ESA)

N80-14328# European Space Agency, Paris (France).
COMPUTATION OF THE RADIATION CHARACTERISTICS OF ANTENNAS ON COMPLICATED STRUCTURES IN THE HIGH FREQUENCY CASE. PRINCIPLE OF THE GEOMETRICAL THEORY OF DIFFRACTION
A. Schrott May 1979 109 p refs Transl. into ENGLISH of "Berechnung der Strahlungscharakteristik von Antennen auf Komplizierten Koerpern im Hochfrequenzfall: Prinzip der geometrishcen Beugungstheorie", Rept. DFVLR-FB-78-02 DFVLR, Oberpfaffenhofen, West Germany, 26 Jan. 1978 Original report in GERMAN previously announced as N79-16184
(ESA-TT-593; DFVLR-FB-78-02) Avail: NTIS HC A06/MF A01

The geometrical theory of diffraction is used to determine the radiation characteristics of antennas on complicated structures, such as satellites and aircrafts and the scattering at these structures in the high frequency case. For the solution, the complicated structures were divided into canonical forms which can be analyzed by rigorous asymptotic methods. Beside the ray-optical construction of the high frequency field, the important canonical problem of the diffraction at an edge was treated extensively. The diffraction coefficients for the computation of the diffracted field are presented. The problem of vertex diffraction is discussed.
Author (ESA)

N80-14329# Institute for Telecommunication Sciences, Boulder, Colo.
TELEVISION RECEIVING ANTENNA SYSTEM COMPONENT MEASUREMENTS
R. G. FitzGerrel, R. D. Jennings, and J. R. Juroshek Jun. 1979 127 p refs
(PB-298873/1) Avail: NTIS HC A07/MF A01 CSCL 09E

Relative gain of fifteen television receiving antennas was measured as a function of frequency and azimuth angle. Input voltage standing-wave ratio was measured as a function of frequency to determine the scalar impedance properties of the antennas. Insertion loss of a sample of system components, balanced-to-unbalanced line transformers and VHF/UHF signal splitters, was measured and transmission line attenuation was obtained from manufacturers' data. Antenna gain, component insertion loss, transmission line attenuation, and calculated dipole antenna constant are the significant components of a power budget equation, relating power flow in the TV signal field incident upon the antenna to the signal power available at the receiver.
GRA

N80-14330# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse de Systemes.
DEFINITION OF THE HIERARCHICAL NETWORK FOR AGGRESSIVE ENVIRONMENTS (RHEA)
M. Buis, J. C. Laprie, J. Marco, and D. R. Powell *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 15 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14332# Standard Elektrik Lorenz A.G., Stuttgart (West Germany).
DIGITAL ARRAY SIGNAL PROCESSING TECHNIQUES APPLIED TO GUIDANCE AND NAVIGATION
S. Bloch *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 13 p (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14335# Contraves Italiana, Rome.
DIGITAL SIGNAL PROCESSING TECHNIQUES IN A MONOPULSE TRACKING RADAR
U. Fazio, F. Ambrosioni, and C. DeBonis *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01

N80-14152*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN RADIO SCIENCE SYSTEM, MARK III-80
A. L. Berman *In its* The Deep Space Network 15 Dec. 1979 p 4-18 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-14330* National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTIPLE ANODE ARC LAMP SYSTEM Patent
Charles G. Miller (JPL) and Ralph E. Bartera, inventors (to NASA) (JPL) Issued 18 Jan. 1972 7 p Filed 29 Dec. 1969 Sponsored by NASA
(NASA-Case-NPO-10857-1; US-Patent-3,635,537; US-Patent-Appl-SN-888362; US-Patent-Class-315-145; US-Patent-Class-315-260; US-Patent-Class-315-334) Avail: US Patent and Trademark Office CSCL 09A

A high-intensity xenon arc lamp having a plurality of separate anodes axially disposed in a symmetrical pattern which spaced a discharge gap from a common cathode is presented.
Official Gazette of the U.S. Patent and Trademark Office

N80-14331 Stevens Inst. of Tech., Hoboken, N. J.
DETERMINATION OF THE VELOCITY-FIELD CHARACTERISTIC OF GALLIUM ARSENIDE FROM FRANZ-KELDYSH ELECTROABSORPTION Ph.D. Thesis
Donald Fairchild Guise 1979 222 p
Avail: Univ. Microfilms Order No. 7925051

An optical method for the measurement of the average electron drift velocity as a function of electric field for semiconductors which exhibit bulk negative differential resistivity was presented. The characteristic was determined from optical transmission measurements made on the semiconductor during the presence of a high-field Gunn-effect domain. The method utilized the Franz-Keldysh effect in which the transmission of laser light through the semiconductor was modulated by the electric field of the Gunn effect domain. By means of stable domain analysis, an analytic technique was given that relates the change in optical transmission and hence the domain profile to the velocity-field characteristic. The method was applied to the measurement of the velocity field characteristic of GaAs.
Dissert. Abstr.

N80-14332* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD FOR ANALYZING RADIATION SENSITIVITY OF INTEGRATED CIRCUITS Patent
Michael K. Gauthier (JPL) and Alan G. Stanley, inventors (to NASA) (JPL) Issued 23 Oct. 1979 7 p Filed 30 Jun. 1978 Supersedes N78-27330 (16 - 18, p 2383) Sponsored by NASA
(NASA-Case-NPO-14350-1; US-Patent-4,172,228; US-Patent-Appl-SN-921627; US-Patent-Class-250-492A; US-Patent-Class-250-310; US-Patent-Class-324-158T) Avail: US Patent and Trademark Office CSCL 09C

A method for analyzing the radiation sensitivity of an integrated circuit is described to determine the components. The application of a narrow radiation beam to portions of the circuit is considered. The circuit is operated under normal bias conditions during the application of radiation in a dosage that is likely to cause malfunction of at least some transistors, while the circuit is monitored for failure of the irradiated transistor. When a radiation sensitive transistor is found, then the radiation beam is further narrowed and, using a fresh integrated circuit, a very narrow beam is applied to different parts of the transistor, such as its

junctions, to locate the points of greatest sensitivity.
Official Gazette of the U.S. Patent and Trademark Office

N80-14333 Mississippi State Univ., State College.
IDENTIFICATION OF LIMIT CYCLES IN MULTINONLINEARITY, MULTIPLE PATH SYSTEMS Ph.D. Thesis
Ottis Lamar Barron 1979 111 p
Avail: Univ. Microfilms Order No. 7927081

A method of analysis which identifies limit cycles in autonomous systems with multiple nonlinearities in multiple forward paths is reported. The nonlinearities may be any time- and frequency-invariant single input, single output type which can be adequately represented in piecewise-linear form. In addition, several harmonic components may be retained in the procedure. Included is the FORTRAN code for implementing the Harmonic Balance Algorithm. Using this code, limit cycles are identified in multi-path, multi-nonlinearity systems while retaining the effects of several harmonic components. Dissert. Abstr.

N80-14334 Virginia Univ., Charlottesville.
CHARGE-COUPLED DEVICE ARCHITECTURES FOR SIGNAL PROCESSING Ph.D. Thesis
Robert Walter Armstrong 1978 160 p
Avail: Univ. Microfilms Order No. 7928039

New charge-coupled device (CCD) architectures are developed for processing images to determine the position, range, and angular orientation of an object subject to translation and rotation within a three-dimensional coordinate system. Information required to establish an object's position and techniques for interpreting the information are presented. Factors affecting the two-dimensional image of a three-dimensional object are listed in detail and form the basis for selecting the features used to determine object position. Methods for horizontal and vertical position determination include an error analysis, estimates of processing time, and a stability analysis. Dissert. Abstr.

N80-14335 Northwestern Univ., Evanston, Ill.
ISOMETRICALLY DEFORMABLE SYNCLASTIC SURFACES AS FLEXIBLE WAVEGUIDES Ph.D. Thesis
Larry I-Hwa Kwan 1979 140 p
Avail: Univ. Microfilms Order No. 7927391

A way of designing flexible waveguides transmissive at infrared wavelengths with diffraction-limited characteristics is described. An approximate analysis shows that rays inside a torus, guided in whispering-gallery fashion, oscillate sinusoidally around the equator. Expressing the Helmholtz equation in toroidal coordinates yields the equivalent index of refraction. The equation can be solved, yielding Airy functions in the direction perpendicular to the surface. Along the surface the equation is similar to that for media with a quadratic index profile, the Hermite-Gaussian solutions of which follow sinusoidal trajectories pulsating in width. Experimental verification of these features is presented. Applications are suggested in the flexible delivery of high-power and/or high quality laser energy in the infrared and far-infrared regions of the electromagnetic spectrum.
Dissert. Abstr.

N80-14336 Yale Univ., New Haven, Conn.
OPTOELECTRONIC PROPERTIES OF METAL-TUNNEL OXIDE-SILICON JUNCTIONS Ph.D. Thesis
Stefan Kwong-Chiu Lai 1979 265 p
Avail: Univ. Microfilms Order No. 7927632

A new switching phenomenon was discovered in a simple Metal-Tunnel Oxide-N Silicon (MTOS) capacitor. Tunneling of holes prevents the build up of an inversion layer at the surface on application of negative bias and the semiconductor goes into deep depletion in which the junction impedance is high. Additional supply of holes from generation by light can increase surface hole concentration. When there is sufficient carrier generation, the surface can become inverted. In the process, the semiconductor voltage decreases and the oxide voltage is increased. Tunneling of electrons is controlled by oxide voltage and can be changed by orders of magnitude when the surface goes from deep depletion to inversion. The process described so far is reversible. The semiconductor goes back into deep depletion if generation by light is removed. Dissert. Abstr.

N80-14337 Oklahoma State Univ., Stillwater.
COEFFICIENT QUANTIZATION EFFECTS ON POLE LOCATIONS FOR STATE-MODEL DIGITAL FILTERS Ph.D. Thesis
James Dale Ledbetter 1979 128 p
Avail: Univ. Microfilms Order No. 7928218

A second order system matrix, capable of realizing poles throughout the unit circle, is introduced for digital filter applications. A technique for obtaining the eigenvalue, or pole, sensitivity of a system matrix from the sensitivity expressions of a companion matrix is presented and used to compare the sensitivity properties of the matrix to the properties of similar second order matrices presented in the literature. For each matrix, sensitivity expressions for determining the magnitude and the corresponding radial and angular components of a pole change due to variations in the matrix elements are presented. Both absolute and normalized element variations are considered. Minimum pole sensitivity regions within the unit circle of the z-plane are shown for each system matrix. The system matrices are also compared regarding coefficient wordlength requirements, realizable pole grids, overflow limit cycles, and roundoff noise. Dissert. Abstr.

N80-14338*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOW TEMPERATURE LATCHING SOLENOID Patent Application
William S. Wang, inventor (to NASA) (Consolidated Controls Corp., El Segundo, Calif.) Filed 29 Nov. 1979 27 p Sponsored by NASA
(NASA-Case-MSC-18106-1; US-Patent-Appl-SN-098568) Avail: NTIS HC A03/MF A01 CSCL 09A

A magnetically latching solenoid is disclosed which includes a pull-in coil and a delatching coil. Each of the coils is constructed with a combination of wire materials, including materials of low temperature coefficient of resistivity, to enable the solenoid to be operated at cryogenic temperatures while maintaining sufficient coil resistance. An armature is springbiased toward a first position that may extend beyond the field of force of a permanent magnet. When voltage is temporarily applied across the pull-in magnet, the induced electromagnetic forces overcome the spring force and pull the armature to a second position within the field of the permanent magnet, which latches the armature in the pulled-in position. Application of voltage across the delatching coil induces electromagnetic force which at least partially temporarily nullifies the field of the permanent magnet at the armature, thereby delatching the armature and allowing the spring to move the armature to the first position. NASA

N80-14339*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
NUMERICAL SIMULATION OF DYNAMICS OF BRUSHLESS DC MOTORS FOR AEROSPACE AND OTHER APPLICATIONS. VOLUME 1: MODEL DEVELOPMENT AND APPLICATIONS. PART B Final Report
N. A. O. Demerdash and T. W. Nehl [1979] 179 p refs
(Contract NAS9-15091)
(NASA-CR-160355) Avail: NTIS HC A09/MF A01 CSCL 09C

A mathematical model was developed and computerized simulations were obtained for a brushless dc motor. Experimentally obtained oscillograms of the machine phase currents are presented and the corresponding current and voltage waveforms for various modes of operation of the motor are presented and discussed.
A.W.H.

N80-14340*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
NUMERICAL SIMULATION OF DYNAMICS OF BRUSHLESS DC MOTORS FOR AEROSPACE AND OTHER APPLICATIONS. VOLUME 2: USER'S GUIDE TO COMPUTER EMA MODEL Final Report
N. A. O. Demerdash and T. W. Nehl [1979] 185 p
(Contract NAS9-15091)
(NASA-CR-160356) Avail: NTIS HC A09/MF A01 CSCL 09C

A description and user's guide of the computer program developed to simulate the dynamics of an electromechanical actuator for aerospace applications are presented. The effects of

the stator phase currents on the permanent magnets of the rotor are examined. The voltage and current waveforms present in the power conditioner network during the motoring, regenerative braking, and plugging modes of operation are presented and discussed. A.W.H.

N80-14341# Royal Aircraft Establishment, Farnborough (England).
INFLUENCE OF THE ENVIRONMENTAL CONDITIONS ON A QUARTZ RESONATOR
Michel Valdois May 1978 114 p refs Transl. into ENGLISH of "Influence des Conditions d'Environnement sur un Resonateur a Quartz", Rept. ONERA-TN-225 Onera, Paris 1974 114 p (RAE-Lib-Trans-1897; BR70941; ONERA-TN-225) Avail: NTIS HC A06/MF A01

The quartz resonator is studied both by itself, as a passive element placed in a transmitting circuit, and installed in an oscillator, which is its normal condition of usage. The accelerations to which the resonators were subjected were steady state, sinusoidal or random. The orientation of the acceleration relative to the quartz crystallographic axis, as well as its direction, were considered. The same tests were performed on oscillators containing the resonators previously studied. The results confirm the part played by the resonator in the degradation of the stability of a quartz oscillator subjected to external disturbances. M.M.M.

N80-14342# Syracuse Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.
THERMAL STRESS ANALYSIS OF GLASS SEALS IN MICROELECTRONIC PACKAGES UNDER THERMAL SHOCK CONDITIONS Final Report
Klod Kokini, Richard W. Perkins, and Charles Libove Griffiss AFB, N.Y. RADC Jul. 1979 117 p
(Contract F30602-78-C-0083; AF Proj. 2306)
(AD-A073654; MAE-1233-T2; RADC-TR-79-201) Avail: NTIS HC A06/MF A01 CSCL 20/13

The objective of this effort was to develop a mathematical model for predicting the transient thermal stresses that occur in a typical annular lead-through glass seal of a microelectronic package during a thermal shock test. The study results show that the magnitude of the thermal stresses in the seal area depends upon the initial residual stresses that result from cooling the package to room conditions after the high temperature sealing process is completed. A computer program was developed to analyze the thermal stresses in any circular lead package while undergoing a thermal shock test. A method has been developed for predicting the stresses which are present in the lead-through seal area of a microelectronic package when subjected to a thermal shock test. GRA

N80-14343# Naval Weapons Center, China Lake, Calif.
PRELIMINARY STUDY OF SOME GRAPHITE ELECTRODE SURFACES RESPONSIVE TO IRON AND HEAVY METALS BY SINGLE-SWEEP VOLTAMMETRY
Gerald C. Whitnack Jan. 1979 14 p refs
(AD-A074605; GIDEP-E138-2687; NWC-TM-3665) Avail: NTIS HC A02/MF A01 CSCL 09/1

The objective of this preliminary study is to see if it is feasible to use some new chemically modified graphite surfaces as electrodes in the field analysis of iron and heavy metals such as copper, lead, cadmium, and zinc in aqueous solution by single-sweep peak voltammetry. This report presents data for iron and some heavy metals obtained from some preliminary experiments performed at NWC with the new graphite electrodes of Clem and NWC polarographic equipment. A short discussion of the results with some conclusions related to future work is given. GRA

N80-14344# Raytheon Co., Waltham, Mass. Microwave and Power Tube Div.
DUAL BEAM DUAL MODE TWT Bimonthly Progress Report, 16 Apr. - 15 Jun. 1979
28 Aug. 1979 7 p refs
(Contract N00014-78-C-0791)
(AD-A074719; PT-5459; MPR-5) Avail: NTIS HC A02/MF A01 CSCL 09/1

The work described in this report is being done for the Office of Naval Research. The program is an outgrowth of work begun in 1974 for the ONR, directed towards building a 10 dB pulse-up, liquid cooled, ppm focused high band TWT. This program is intended to finish development of this tube in time for current and next generation system use and to establish two sources for the device. To achieve this objective, the resources of Raytheon and a subcontractor (Northrop) are being employed in a cooperative development program. The statement of work for this program is Raytheon proposal No. PRP-4430-1 entitled 'Technical Proposal for a Dual Beam Dual Mode TWT', dated 8 June 1978. To insure that all essential system performance factors are adequately addressed, a complete tube specification is being used: specifically, the Dual Mode Steering Committee Dual Mode TWT specification (originally released 12 September 1977) as amended by O.E.M. submissions to the system statement of work received May 1, 1978. GRA

N80-14345# Arinc Research Corp., Annapolis, Md.
OPERATING MANUAL FOR THE DYNAMIC TEST SET (DTS) FOR THE LOW VOLTAGE POWER SUPPLY PART OF THE AN/ALQ-119 V ELECTRONIC COUNTERMEASURES SYSTEM
J. R. White Sep. 1979 61 p
(Grant F09603-78-G-4125)
(AD-A074894; Rept-1552-11-2-2015) Avail: NTIS HC A04/MF A01 CSCL 10/2

This manual contains operating instructions for the Dynamic Test Facility (DTF) used for checkout and repair of interchangeable low voltage power supplies P/N 624R629G01 and P/N 634R149G01 of the AN/ALQ 119 (V) Electronic Countermeasures (ECM) Pod. Author (GRA)

N80-14346# Los Alamos Scientific Lab., N. Mex.
WAVE PROPAGATION IN A dc SUPERCONDUCTING CABLE. PART 1: ANALYSIS
P. Chowdhuri and Mary-Anne Maiuffy 1979 7 p refs Presented at the IEEE Summer Power Meeting, Vancouver, Canada, Jul. 1979
(Contract W-7405-eng-36)
(LA-UR-79-226; CONF-790713-1) Avail: NTIS HC A02/MF A01

A dc superconducting cable design consisting of four concentric metallic cylinders, of which two carry the load current and two comprise the cryogenic enclosure, was studied. The surge-voltage propagation characteristics of a four-conductor dc superconducting cable for a step-function input voltage was analyzed. This analysis, although mainly directed to superconducting cables, is also applicable to other multiconductor transmission lines. DOE

N80-14347# Idaho National Engineering Lab., Idaho Falls.
DESIGN AND PERFORMANCE OF THE DRAG-DISC TURBINE TRANSDUCER
R. H. Averill, L. D. Goodrich, and R. E. Ford 1979 34 p refs Presented at the Colloq. on Two-Phase Instrumentation, Idaho Falls, Idaho, 11 Jun. 1979
(Contract EY-76-C-07-1570)
(CONF-790655-2) Avail: NTIS HC A03/MF A01

Mass flow rates are measured with the drag-disc turbine transducer (DTT). Operational description of the DTT and the developmental effort are discussed. Performance data and experiences with this transducer are presented. DOE

N80-14348# California Univ., Berkeley. Lawrence Berkeley Lab.
ENERGY-DEPENDENT LOSSES IN PULSED-FEEDBACK PREAMPLIFIERS
D. A. Landis, N. W. Madden, and F. S. Goulding Nov. 1978 18 p refs Presented at IEEE Nucl. Sci. Symp., Washington, D.C., 18 Oct. 1978
(Contract W-7405-eng-48)
(LBL-8135; CONF-781033-46) Avail: NTIS HC A02/MF A01

Energy dependent counting losses occur in most pulsed-feedback preamplifiers due to the loss of those pulses which activate the recharge system. A pulsed-feedback system that overcomes this inefficiency is described. Pulsed-light feedback as used with germanium gamma ray spectrometers is discussed

as used at high energies and high rates where those losses become significant. DOE

N80-14349# Department of Energy, Washington, D. C.
ELECTRIC AND HYBRID VEHICLES: COMMERCIALIZATION PHASE 3 PLANNING
R. C. Clusen Sep. 1978 37 p refs
(DOE/ERD-0004) Avail: NTIS HC A03/MF A01

A program to stimulate the commercialization of electric and hybrid vehicles (EHVs) as a partial solution to the oil consumption problem is presented. The commercialization of EHVs by the purchase or lease and demonstration of state-of-the-art and advanced vehicles through 1985 is described. The major vehicle categories are: (1) specific-mission electric vehicles; (2) general purpose electric vehicles; and (3) general purpose hybrid vehicles. The subjects covered are: the characteristics of the technology, status information on the technical and environmental research and development programs; a milestone chart representing a relationship between a considered commercialization schedule and relevant environmental research and development; and the environmental concerns significant to the technology. DOE

N80-14350# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
TEST SPECIFICATION FOR TWO-SIDED PRINTED CIRCUIT BOARDS (GOLD PLATED FINISH)
Paris ESA Aug. 1979 64 p
(ESA-PSS-05/QRM-10E-ESTEC-Iss-2) Avail: NTIS HC A04/MF A01

The minimum test program required for ESA approval of production lines for two-sided printed circuit boards with gold-plated finish is defined. The mandatory test methods are described and details of accept/reject criteria are given.
Author (ESA)

N80-14156*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EXAMINATION OF ANCILLARY EQUIPMENT FOR A PROPOSED 34.3 GHz HIGH POWER GYROTRON TWT AMPLIFIER
A. Kupiszewski *In its* The Deep Space Network 15 Dec. 1979 p 34-40 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

N80-14157*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF THE VA-876P KLYSTRON FOR THE 20-kW X-BAND UPLINK TRANSMITTER
R. B. Kolbly *In its* The Deep Space Network 15 Dec. 1979 p 41-50 ref (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

N80-14158*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A COMPUTER-AIDED DESIGN SYSTEM FOR CUSTOM LARGE-SCALE INTEGRATED CIRCUITS
M. W. Sievers *In its* The Deep Space Network 15 Dec. 1979 p 51-61 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-14351 Minnesota Univ., Minneapolis.
VISCOUS FILM FLOWS WITH CONTACT LINES: FINITE ELEMENT SIMULATION, A BASIS FOR STABILITY ASSESSMENT AND DESIGN OPTIMIZATION Ph.D. Thesis
William James Silliman 1979 348 p
Avail: Univ. Microfilms Order No. 7926172

The problems of capillarity and of flows with free surfaces are solved in most instances by the finite element technique. An incidence-array analysis of the structure of the finite element equation sets settles a controversy regarding the correct way to handle flow calculations. Moreover, it leads to a method which is superior to any yet to appear. The approach is based on a Newton iteration and generates the framework for predicting ranges of influence of local features of the flow fields, continuing solution families by Euler-like expressions, and, in the future, determining stability. Dissert. Abstr.

N80-14352 Kansas State Univ., Manhattan.
AN EXPERIMENTAL STUDY OF NATURAL CONVECTION HEAT TRANSFER IN VERTICAL POROUS MEDIA Ph.D. Thesis
Ulysses Aquino Acasio 1979 182 p
Avail: Univ. Microfilms Order No. 7926543

The effect of different height-to-width ratios of the enclosure on the flow, velocity, and temperature profiles of a fluid in a vertically oriented porous medium was examined. The porous medium consisted of glass beads saturated with water. It was observed that the fluid near the wall flowed upward and was 2 to 3 times faster than the downward flow of the fluid in the porous bed center. The change from downward to upward flow of the fluid occurred at a location which was about 4/5 the distance from the center of the bed to the inner surface of the heated wall. It was observed that the angle at which a streamline approached the bottom corner of the enclosure changed with a corresponding change in the aspect ratio of the porous medium. The temperature distribution was linear in beds with aspect ratios less than 1.0 and decreased monotonically from the upper corner of the medium and diagonally toward the bottom center of the enclosure. With aspect ratios greater than 1.0 the isotherms advanced toward the bed's center and then bent downward as time progressed, indicating an enhancement of the heat transfer process because of convective flow. Dissert. Abstr.

N80-14353 California Univ., Los Angeles.
HYDRODYNAMICAL ASPECTS OF LOW FLOW VAPOR INJECTION INTO SUBCOOLED WATER Ph.D. Thesis
Chok-kau Binky Lee 1979 351 p
Avail: Univ. Microfilms Order No. 7926040

The condensation-induced hydrodynamic loads during low flow vapor injection (steam chugging) was studied. Systematic classification of characteristic patterns based on two parameters resulted in a condensation regime map. The basic regimes in the map are: the jet regime at high mass fluxes (>150 Kg/sq m/sec); the bubble oscillation regime at intermediate mass fluxes; and the steam chugging regime at low mass fluxes (<75 Kg/sq m/sec). The hydrodynamic loads measured at the pool bottom show mild oscillations (0.1 atm.) for internal chugs; moderate oscillations (3 atm) for detached bubble chugs; and large spiky oscillations (5 atm.) for encapsulating bubble chugs. Dissert. Abstr.

N80-14354*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
GIM CODE USER'S MANUAL FOR THE STAR-100 COMPUTER Final Report
Lawrence Spradley and Mark Pearson Nov. 1979 217 p refs
(Contract NAS1-15341)
(NASA-CR-3157; LMSC-HREC-0568850) Avail: NTIS HC A10/MF A01 CSCL 20D

The General Interpolants Method (GIM), a three dimensional, time dependent, hybrid procedure for generating numerical analogs of the conversion laws, is described. The Navier-Stokes equations written for an Eulerian system are considered. The conversion of the GIM code to the STAR-100 computer, and the implementation of 'GIM-ON-STAR' is discussed. M.G.

N80-14355*# Wisconsin Univ. - Milwaukee.
UNSTEADY FLOW AND DYNAMIC RESPONSE ANALYSES FOR HELICOPTER ROTOR BLADES Final Progress Report, 2 Jan. 1971 - 30 Jun. 1979
Theodore Bratanow Nov. 1979 30 p refs
(Grant NGR-50-007-001)
(NASA-CR-159190) Avail: NTIS HC A03/MF A01 CSCL 02A

Research is presented on helicopter rotor blade vibration and on two and three dimensional analyses of unsteady incompressible viscous flow past oscillating helicopter rotor blades. A summary is presented of the two international research collaborations which resulted from the NASA project: the collaboration under the auspices of NATO between the University of Wisconsin-Milwaukee, University of Brussels, Belgium and the Aerodynamics Research Establishment in Goettingen, West Germany, and the collaboration under the auspices of the National Science Foundation between UWM and the University of Hamburg and the Ship Research Establishment in Hamburg, West Germany. A summary is given of the benefits from the NASA project to UWM, the College of Engineering and Applied Science, and the participants on the project. M.M.M.

N80-14356*# Scientific Research Associates, Inc., Glastonbury, Conn.

DEVELOPMENT OF A THREE-DIMENSIONAL SUPERSONIC INLET FLOW ANALYSIS Final Report

R. C. Buggeln, H. McDonald, R. Levy, and J. P. Kreskovsky Jan. 1980 122 p refs

(Contract NAS3-21003)

(NASA-CR-3218) Avail: NTIS HC A06/MF A01 CSCL 20D

A method for computing three dimensional flow in supersonic inlets is described. An approximate set of governing equations is given for viscous flows which have a primary flow direction. The governing equations are written in general orthogonal coordinates. These equations are modified in the subsonic region of the flow to prevent the phenomenon of branching. Results are presented for the two sample cases: a Mach number equals 2.5 flow in a square duct, and a Mach number equals 3.0 flow in a research jet engine inlet. In the latter case the computed results are compared with the experimental data. A users' manual is included. Author

N80-14357*# Illinois Inst. of Tech., Chicago.

ON THE QUESTION OF INSTABILITIES UPSTREAM OF CYLINDRICAL BODIES Final Report, 15 Nov. 1974 - 30 Apr. 1977

Mark V. Morkovin Dec. 1979 113 p refs

(Grant NsG-1120)

(NASA-CR-3231; R79-3) Avail: NTIS HC A06/MF A01 CSCL 20D

In an attempt to understand the unsteady vortical phenomena in perturbed stagnation regions of cylindrical bodies, a critical review of the theoretical and experimental evidence was made. Current theory is revealed to be incomplete, incorrect, or inapplicable to the phenomena observed experimentally. The formalistic approach via the principle of exchange of instabilities should most likely be replaced by a forced-disturbance approach. Also, many false conclusions were reached by ignoring that treatment of the base and perturbed flows in Hiemenz coordinate eta is asymptotic in nature. Almost surely the techniques of matched asymptotic expansions are expected to be used to capture correctly the diffusive and vorticity amplifying processes of the disturbances regarding the mean-flow boundary layer and outer potential field as eta and y/diameter approach infinity. The serious uncertainties in the experiments are discussed in detail. M.M.M.

N80-14358*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

POTENTIAL HEAT EXCHANGE FLUIDS FOR USE IN SULFURIC ACID VAPORIZERS

D. D. Lawson and G. R. Petersen 1 Oct. 1979 16 p refs

(Contracts NAS7-100; ET-78-I-01-3112)

(NASA-CR-162548; JPL-Pub-79-81) Avail: NTIS HC A02/MF A01 CSCL 20D

A series of perhalocarbons are proposed as candidate heat exchange fluids for service in thermochemical cycles for hydrogen production that involve direct contact of the fluid with sulfuric acid and vaporization of the acid. The required chemical and physical criteria of the liquids are described and the results of some preliminary high temperature test data are presented. M.G.

N80-14359*# Bionetics Corp., Hampton, Va.

THE TRANSFER OF CARBON FIBERS THROUGH A COMMERCIAL AIRCRAFT WATER SEPARATOR AND AIR CLEANER

Jerome A. Meyers Nov. 1979 22 p refs

(Contract NAS1-15238)

(NASA-CR-159183) Avail: NTIS HC A02/MF A01 CSCL 20D

The fraction of carbon fibers passing through a water separator and an air filter was determined in order to estimate the proportion of fibers outside a closed aircraft that are transmitted to the electronics through the air conditioning system. When both devices were used together and only fibers 3 mm or larger were considered, a transfer function of .001 was obtained. K.L.

N80-14360# Royal Aircraft Establishment, Farnborough (England).

THE CALCULATION OF INVISCID SEPARATED FLOW ABOUT A SLENDER CONE FOR LARGE ANGLES OF ATTACK

S. B. Zacharov May 1979 13 p refs Transl. into ENGLISH from Uch. Zap. TSAGI (USSR), v. 7, no. 6, 1976 13 p

(RAE-TR-2009) Avail: NTIS HC A02/MF A01

The symmetrical, separated flow about a circular cone was calculated using slender body theory. The configuration of vortex layers, the coefficients of the normal force, and the pressure distribution are determined. K.L.

N80-14361# Idaho National Engineering Lab., Idaho Falls.

ULTRASONIC DENSITY DETECTOR FOR VESSEL AND REACTOR CORE TWO-PHASE MEASUREMENTS

A. E. Arave 1979 25 p refs Presented at the Intern. Colloq. on Irradiation for Reactor Safety Programmes, Petten, Netherlands, 25 Jun. 1979

(Contract EY-76-C-07-1570)

(CONF-790646-5) Avail: NTIS HC A02/MF A01

A local ultrasonic density detector was developed for the Loss-of-Fluid Test reactor vessel and core two-phase flow density measurements. The principle of operating the sensor is the change in propagation time of a torsional ultrasonic wave in a metal transmission line as a function of the density of the surrounding media. A theoretical physics model is presented which represents the total propagation time as a function of the sensor modulus of elasticity and polar moment of inertia. DOE

N80-14362# Oak Ridge Gaseous Diffusion Plant, Tenn.

HYDRAULIC JUMPS IN A PARTIALLY FILLED ROTATING CYLINDER

T. S. Lundgren and A. S. Berman Jun. 1979 28 p

(Contract W-7405-eng-26)

(K/TS-2936) Avail: NTIS HC A03/MF A01

A nonlinear analysis is made of the fluid dynamics of a thin film of liquid completely spun up along the cylindrical wall of a rotating cylinder. The analysis allows for the possibility of hydraulic jumps on the liquid film. Conditions are simulated under which jumps can occur. Under the assumption that synchronous runouts are small relative to the film thickness, a sample calculation of jump position and extent for various operating frequencies is presented. Comparison with experimental observations indicate good qualitative agreement between the analysis and the experiment. Under the additional restriction of constant film thickness and a simple lumped-parameter dynamic model for the rotor and its supports, an analysis is also provided which predicts the amplitude and frequency of the asynchronous runout as a function of operating frequency. A numerical example of the results of such a calculation is provided. DOE

N80-14363# Idaho National Engineering Lab., Idaho Falls.

MASS FLOW RATE MEASUREMENTS IN TWO-PHASE MIXTURES WITH STAGNATION PROBES

J. R. Fincke and V. A. Deason 1979 79 p refs Presented at Colloq. on Two-Phase Instrumentation, Idaho Falls, Idaho, 11 Jun. 1979

(Contract EY-76-C-07-1570)

(CONF-790655-1) Avail: NTIS HC A05/MF A01

Applications of stagnation probes to the measurement of mass flow rate in two-phase flows are discussed. Descriptions of several stagnation devices, which have been evaluated at the Idaho National Engineering Laboratory, are presented along with modeling techniques and two-phase flow data. DOE

N80-14384# Hague International, South Portland, Maine.
HIGH PRESSURE CERAMIC HEAT EXCHANGER. PHASE 1: DEADHEAD EXPERIMENTAL VERIFICATION
20 Feb. 1979 54 p refs
(Contract EC-77-C-02-4236)
(COO-4236-3) Avail: NTIS HC A04/MF A01

The pressure containment capability of ceramic heat exchangers to be used in gas turbine power conversion systems was tested using a modified industrial recuperator. The results of cold and elevated temperature leakage experiments are described. K.L.

N80-14385# Argonne National Lab., Ill. Applied Mathematics Div.
NUMERICAL METHODS FOR A POROUS MEDIUM EQUATION
Michael E. Rose Aug. 1978 56 p refs
(Contract W-31-109-eng-38)
(ANL-78-80) Avail: NTIS HC A04/MF A01

The degenerate parabolic equation par. delta u/par. delta t = div (u/sup nu/grad u), nu >0 is used to model the flow of gas through a porous medium. Error estimates for continuous and discrete-time finite-element procedures to approximate the solution of this equation are proved, and a new regularity result is described. DOE

N80-14366# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATION OF COHERENT STRUCTURES IN THE VELOCITY FIELD OF A FULLY DEVELOPED TURBULENT CHANNEL FLOW USING FLOW VISUALIZATION AND ANEMOMETRY
Michael Hofbauer 1978 103 p refs In GERMAN; ENGLISGH summary
(MPIS-Mitt-66; ISSN-0374-1257) Avail: NTIS HC A06/MF A01

Coherent structures observed in oil channel flow test are investigated. The Reynolds number, 8050, was based on the channel width and the mean center line velocity. A one to one correspondence of structures in the time signals of u and v as well as of visually recognized structures of the flow field, was found by simultaneously performing hot film measurements and taking pictures with a film camera. Due to the high spatial resolution in the oil channel it was possible to detect the cause of the lift up of the low speed streaks and to show that before the lift up there were no vortices. The Tollmien-Schlichting frequencies were seen in the power spectra of v. This supported Landahl's model of turbulence. A dualistic view of turbulent motions determined from the results is discussed. Author (ESA)

N80-14367# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTS TO SHOW THE EXISTENCE OF THE LIQUEFACTION SHOCK WAVE IN RETROGRADE GASES
Georg Dettleff 1978 129 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-67; ISSN-0374-1257) Avail: NTIS HC A07/MF A01

The existence of the liquefaction shock wave in retrograde gases is investigated. Retrograde gases are characterized by a particular condensation behavior, are liquefied by means of isentropic compression and, under restricted conditions, by means of shock compression. The production of liquid by means of shock compression is proven by establishing the thermodynamic state. The pressure, the temperature, and the density are measured as is the velocity of the liquefaction shock wave. By means of photographs, a great number of ring shaped objects behind the liquefaction shock wave were observed. Their properties, such as size, growth, and lifetime were investigated. Possible interpretations of the ring shaped objects as bubbles, driplets, or ring vortices are discussed. Author (ESA)

N80-14368# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
AN INVESTIGATION OF THE FLUCTUATIONS OF THE WALL PRESSURE AND THE WALL PRESSURE GRADIENT BENEATH A TURBULENT BOUNDARY LAYER
Guenter Schewe 1979 89 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-68) Avail: NTIS HC A05/MF A01

Fluctuations of the wall pressure and wall pressure gradient were investigated in a wind tunnel designed for acoustic measurements. The Reynolds number based on momentum thickness was 1400. It was shown that the diameter of the small transducers developed for these measurements is small enough to resolve the essential structures of turbulence. Correlation measurements of the pressure gradients and visual analysis of the time functions lead to a mean frequency and a mean wave length for characteristic high amplitude structures. The existence of these pressure structures explains the increase in the RMS value with decreasing transucer diameter and the characteristic feature of the probability density distribution. In the power spectrum there are indications of the existence of Tollmien-Schlichting waves. Author (ESA)

N80-14369# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
WALL PRESSURE FLUCTUATIONS GENERATED BY A PAIR OF VORTICES [WANDDRUCKSCHWANKUNGEN ERZEUGT DURCH EIN WIRBELPAAR]
W. Moehring and Sayeed-ur-Rahman Feb. 1979 35 p refs In GERMAN; ENGLISH summary
(MPIS-6/1979) Avail: NTIS HC A03/MF A01

The wall pressure field generated by two potential vortices of equal circulation situated in the vicinity of a flat wall is calculated. This configuration is regarded as a strongly simplified flow model of the mutual influence between vortices and walls. Two different types of flow fields are distinguished. Either the vortices remain together, or one of them overtakes the other and separates from it increasingly. It is found that although the far field generated by two adjacent vortices is similar to the velocity field of a single vortex of twice the circulation, the pressure field is quite different. Author (ESA)

N80-14370# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).
STABILITY OF A FLAT WALL JET [STABILITE D'UN JET PARIETAL PLAN]
Daniel Durox and Marie-Francoise Scibilia Feb. 1979 32 p refs In FRENCH
(Rept-79-5; Publ-597) Avail: NTIS HC A03/MF A01

A theoretical computation of plane wall jet stability is presented. The Galerkin method was applied to the Orr-Sommerfeld equation to establish the stability conditions. Computations were made using double precision FORTRAN language on an IBM 360/138 computer. The precision of the results is sufficient for a first approach to the instability critical point determination. The numerical values obtained in several examples are given and compared to those obtained by other methods. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-14371* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DISPLACEMENT PROBES WITH SELF-CONTAINED EXCITING MEDIUM Patent
Robert Miserentino and Bruce Flagge, inventors (to NASA) Issued 23 Oct. 1979 5 p Filed 26 Jul. 1978 (16 - 22, p 2943)
(NASA-Case-LAR-11690-1; US-Patent-4,171,645; US-Patent-Appl-SN-928129; US-Patent-Class-73-655; US-Patent-Class-73-661) Avail: US Patent and Trademark Office CSCL 14B

A transducer that combines a noncontacting displacement probe with a self-contained target is described. The target is

held in position against a vibrating surface by a housing which also supports the noncontacting probe. The target vibrates with the surface and the probe senses the vibrations of the target.
Official Gazette of the U.S. Patent and Trademark Office

N80-14372 Washington Univ., Seattle.
SIMULTANEOUS MULTIPLE CAMERA AND MULTIPLE FOCAL SETTING SELF-CALIBRATION IN PHOTOGRAMMETRY Ph.D. Thesis
Clive Simpson Fraser 1979 168 p
Avail: Univ. Microfilms Order No. 7927786

Theoretical and practical aspects of simultaneous multiple camera and multiple focal setting self-calibration techniques for metric cameras, are investigated. An experimental verification of the proposed analytical camera calibration methods is carried out. It was concluded that both reported techniques offer practical and theoretically rigorous alternatives to existing methods of close-range single and multiple camera system calibration.
Dissert. Abstr.

N80-14373# National Bureau of Standards, Washington, D.C. National Engineering Lab.
NBS INTERAGENCY TRANSDUCER PROJECT 1951 - 1979: AN OVERVIEW
Paul S. Lederer Aug. 1979 45 p refs Supersedes NBS-TN-469
(NBS-TN-1110; NBS-TN-469) Avail: SOD HC

The performance of sensory transducers, primarily those used in telemetry is presented. A description is provided of the background and history of the project, of its objectives, of some of the techniques and specialized facilities developed and used, and of some of the publications that were issued from the project.
M.M.M.

N80-14374*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEMPERATURE AND PRESSURE MEASUREMENT TECHNIQUES FOR AN ADVANCED TURBINE TEST FACILITY
Frank G. Pollack and Reeves P. Cochran 1980 12 p refs Proposed for presentation at the Intern. Gas Turbine Conf. and Ann. Fluids Engr. Conf., New Orleans, 9-13 Mar. 1980; sponsored by Am. Soc. Mech. Engr.
(NASA-TM-79278; E-212) Avail: NTIS HC A02/MF A01 CSCL 14B

A high pressure, high-temperature turbine test facility constructed for use in turbine cooling research is described. Several recently developed temperature and pressure measuring techniques are used in this facility. The measurement techniques, their status, previous applications and some results are discussed. Noncontact surface temperature measurements are made by optical methods. Radiation pyrometry principles combined with photoelectric scanning are used for rotating components and infrared photography for stationary components. Contact (direct) temperature and pressure measurements on rotating components are expected to be handled with an 80 channel rotary data package which mounts on and rotates with the turbine shaft at speeds up to 17,500 rpm. The data channels are time-division multiplexed and converted to digital words in the data package. A rotary transformer couples power and digital data to and from the shaft.
M.M.M.

N80-14375*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFICIENT LASER ANEMOMETER FOR INTRA-ROTOR FLOW MAPPING IN TURBOMACHINERY
J. Anthony Powell, Anthony J. Strazisar, and Richard G. Seasholtz 1979 11 p refs Proposed for presentation at the ASME 25th Ann. Intern. Gas Turbine Conf., and the 22nd Ann. Fluids Eng. Conf., New Orleans, 9-13 Mar. 1980
(NASA-TM-79320; E-276) Avail: NTIS HC A02/MF A01 CSCL 14B

A fringe type laser anemometer is described. Features of the anemometer include: a rapid and efficient data acquisition process; a detailed real time graphic display of the data being accumulated; and input laser beam positioning that maximizes the size of the intrarotor region being mapped. Results are presented that demonstrate the anemometer's capability in flow mapping within a transonic axial flow compressor rotor. A velocity profile, derived from 30,000 measurements along 1000 sequential circumferential positions covering 20 blade passages, was obtained in 30 seconds. The use of fluorescent seed particles allowed flow measurements near the rotor hub and the casing window.
R.C.T.

N80-14376# Royal Aircraft Establishment, Farnborough (England).
FUNCTION ANSD COMPUTATION OF TRANSDUCERS FOR THE CONTACT-FREE MEASUREMENT OF DISTANCE ON THE BASIS OF THE EDDY CURRENT EFFECT, PART 1
H. R. Loos Jun. 1979 22 p refs Transl. into ENGLISH from Tech. Messen ATM (West Germany), v. 7/8, 1976 p 229-234
(RAE-TR-2021) Avail: NTIS HC A02/MF A01

Contact free-measurements of distance can be made using inductive transducers. These operate by changes in the impedance of a coil by magnetic and eddy current effects. A simplified model is described.
Author

N80-14377# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
US ARMY TEST AND EVALUATION COMMAND TEST OPERATIONS PROCEDURES: PHOTOGRAPHIC AND VIDEO IMAGE SUPPORT AVIATION MATERIEL Final Report
17 Aug. 1979 16 p refs
(AD-A074883; TOP-7-3-519) Avail: NTIS HC A02/MF A01 CSCL 14/5

Photographic techniques can be utilized to obtain precise data in relation to time velocity, rates and characteristics of a developmental test event or simply to document a physical defect, deficiency or shortcoming in a human factors evaluation. This document provides requirements, suggestions and techniques for incorporating photographic coverage into the developmental test of aviation materiel.
GRA

N80-14378# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
FEI CAMERA SYSTEM, ACCEPTANCE TEST AND CHECK-OUT PROCEDURE, AS INSTALLED IN BQM-34 A/S AND BQM-34 E/T
Robert C. Bello and Frank X. Murphy 13 Sep. 1979 34 p (W06130000)
(AD-A074388; NADC-79233-60) Avail: NTIS HC A03/MF A01 CSCL 14/5

This report describes the acceptance test and checkout procedure for Firing Error Indicator Camera System. This system can be installed in the BQM-34A/S and BQM-34E/T aerial targets. The tests presented herein constitute a quality control check and acceptance test to be performed on each camera system.
GRA

N80-14379# California Univ., Livermore. Lawrence Livermore Lab.
LOW IMPEDANCE MANGANIN STRESS GAUGE SYSTEM FOR SEVERE SHOCK WAVE ENVIRONMENTS
R. Weingart, J. Chan, L. Erickson, J. Janzen, H. Vantine, and R. Lee 26 Apr. 1979 13 p refs Presented at the Transducer Workshop, Colorado Springs, Colo., 12 Jun. 1979 Prepared jointly with Kansas State Univ., Manhattan
(Contract W-7405-eng-48)
(UCRL-81605; CONF-790635-1) Avail: NTIS HC A02/MF A01

A manganin piezoresistive stress gauge system with an extended lifetime in severe hydrodynamic environments and a reproducibility better than 2% was developed.
DOE

N80-14380# Fulmer Research Inst. Ltd., Stoke Poges (England).
SPACE DOSIMETRY. VOLUME 1: PROJECT DESCRIPTION Final Report
A. Holmes-Siedle 1978 67 p refs
(Contract ESA-2440/74-HP)
(FRI-R646/3-Vol-1; ESA-CR(P)-1176-Vol-1) Avail: NTIS HC A04/MF A01

The dosimetry of radiation sources and the design as well as procurement of special dosimetric MOS devices (the TOT series) are discussed. The devices were first used for laboratory dosimetry and, later, incorporated in two ESTEC flight units which

are now monitoring internal radiation in geostationary orbit. The final transistors produced (TOT200 series) show good dosimetric properties and are more radiation-sensitive than any conventional transistor. Other support was given to ESTEC in the areas of physical analysis, thermoluminescence studies, the provision of a calibrated cobalt-60 source and some space environment analyses. Author (ESA)

N80-14381# European Space Agency, Paris (France).
SYNCHRONIZATION OF CLOCKS IN THE 100 ps RANGE
Jean-Patrick Moreau Oct. 1979 195 p refs Transl. into ENGLISH of "Synchronisation d'Horloges dans le Domaine 100 ps", Rept. ONERA-NT-1978-1 ONERA, Mar. 1978 Original report in FRENCH previously announced as N79-32968 (ESA-TT-578; ONERA-NT-1978-1) Avail: NTIS HC A09/MF A01

The development of a method for measuring, with high resolution (100 ps), the differences between distant atomic clocks is presented. The synchronization operation is analyzed and the main characteristics of the set of measuring units are determined. The principle of the system is described as the transfer of the time information by an optical channel using a semiconductor laser. The various instruments including time scales, transducers, telescopes, and chronometers are described. The results of two experiments concerning the synchronization of clocks from 6 km apart to several thousand km apart are presented. The synchronization method by laser beam achieves the expected accuracy of 100 ps when the clocks are in direct view and is better than 1 ps when they are separated by several hundred kilometers. Author (ESA)

N80-14382# National Ocean Survey, Rockville, Md. Test and Evaluation Lab.
PERFORMANCE EVALUATION OF THE HORIBA INSTRUMENTS, INCORPORATED MODEL U-7 WATER QUALITY CHECKER
Jerald M. Peterson, Charles C. White, Barbara S. Pijanowski, and Gary K. Ward Jun. 1979 24 p refs
(PB-298815/2; NOAA-TM-NOS-24; NOAA-79070908) Avail: NTIS HC A02/MF A01 CSCL 14B

Test and evaluation results are reported for a general purpose, handheld water quality checker designed to measure temperature, conductivity, pH, dissolved oxygen, and turbidity. A system description, manufacturer's specifications, and performance results with associated figures and tables giving accuracy, precision, stability, and environmental effects are provided for all parameters with the exception of turbidity. GRA

N80-14995*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MONITOR PROPORTIONAL COUNTER
M. C. Weisskopf *In its* HEAO Sci. Symp. Nov. 1979 p 347-366 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-14383 Johns Hopkins Univ., Baltimore, Md.
MEASURED PERFORMANCE OF LASER INTENSITY SUBCARRIER DIRECT DETECTION OPTICAL COMMUNICATION RECEIVERS Ph.D. Thesis
Chung-Min Chao 1979 149 p
Avail: Univ. Microfilms Order No. 7924608

The filtering and detection methods associated with doubly stochastic Poisson processes were tested in the context of a direct detection optical communication system. Two types of transmission media were tested: a free space channel and a log-normal fading channel. The simplified sub-optimal estimation methods produced slightly less accurate estimates than the optimal ones but had a substantial reduction in processing time requirements. The intensity estimates obtained were used in the likelihood ratio test for the case of binary signal detection. It was found that, under certain conditions, the conventional radio frequency detector and estimator achieved the same performance as the doubly stochastic Poisson processes. In the case of binary signal detection, the direct detection of a subcarrier frequency shift key system achieved the same performance as a heterodyne detection optical frequency shift key system. The experiments showed the feasibility of an easily implemented optical communication system with the technology currently available. Dissert. Abstr.

N80-14384* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER APPARATUS Patent
Gerhard A. Koepf, inventor (to NASA) (NSF, Washington, D.C.) Issued 30 Oct. 1979 9 p Filed 29 Sep. 1977 Supersedes N78-10445 (16 - 01, p 0086) Sponsored by NASA
(NASA-Case-GSC-12237-1; US-Patent-4,173,001; US-Patent-Appl-SN-837795; US-Patent-Class-331-94.5C; US-Patent-Class-331-94.5P) Avail: US Patent and Trademark Office CSCL 20E

A laser apparatus having a pump laser device for producing pump laser energy upon being excited is disclosed. The pump laser device has a resonating cavity for oscillating and amplifying the pump laser energy. A source laser device is used for producing source laser energy upon being excited by the pump laser energy. The source laser device has a resonating cavity for oscillating and amplifying the source laser energy. The source laser's resonating cavity is coupled within a portion of the pump laser's resonating cavity.
Official Gazette of the U.S. Patent and Trademark Office

N80-14385 Washington Univ., Seattle.
REMOTE SENSING OF MICROPARTICLES BY LASER SCATTERING FOR MEDICAL APPLICATIONS: APPROACH WITH TRANSPORT THEORY AND PICOSECOND OPTICAL RANGE-GATING Ph.D. Thesis
Koichi Shimizu 1979 300 p
Avail: Univ. Microfilms Order No. 7927871

Three techniques were developed for the remote sensing of microparticles by laser scattering. They were applied to the noninvasive probing of biological particles, namely bacteria in urine, cataracts in the eye, and platelets in blood, respectively. These are: (1) the Fourier transform inversion technique which determines the size distribution of tenuous scatterers from the forward scattering pattern; (2) the backward scattering pattern analysis technique which determines an average size and variance of tenuous scatterers from the backward scattering pattern; and (3) the pulse backscattering technique which evaluates the scattering and absorption characteristics of scatterers in a dense medium by means of backscattered pulses. Dissert. Abstr.

N80-14386*# Rasor Associates, Inc., Sunnyvale, Calif.
A CESIUM TELEC EXPERIMENT AT LEWIS RESEARCH CENTER Final Report
E. J. Britt Sep. 1979 59 p refs
(Contract NAS3-21149)
(NASA-CR-159729; NSR-8-1) Avail: NTIS HC A04/MF A01 CSCL 20E

The thermoelectronic laser energy converter (TELEC), was studied as a method of converting a 10.6 mm CO2 laser beam into electric power. The calculated characteristics of a TELEC seem to be well matched to the requirements of a spacecraft laser energy conversion system. The TELEC is a high power density plasma device which absorbs an intense laser beam by inverse bremsstrahlung with the plasma electrons. In the TELEC process, electromagnetic radiation is absorbed directly in the plasma electrons producing a high electron temperature. The energetic electrons diffuse out of the plasma striking two electrodes which are in contact with the plasma at the boundaries. These two electrodes have different areas: the larger one is designated as the collector, the smaller one is designated as the emitter. The smaller electrode functions as an electron emitter to provide continuity of the current. Waste heat is rejected from the collector electrode. An experiment was carried out with a high power laser using a cesium vapor TELEC cell with 30 cm active length. Laser supported plasma was produced in the TELEC device during a number of laser runs over a period of several days. Electric power from the TELEC was observed with currents in the range of several amperes and output potentials of less than 1 volt. The magnitudes of these electric outputs were smaller

than anticipated but consistent with the power levels of the laser during this experiment. J.M.S.

N80-14387# Cornell Univ., Ithaca, N. Y. Baker Lab.
KINETIC ASPECTS OF GAS PHASE METAL ATOM OXIDATION REACTIONS Final Report, 1 Jun. 1978 - 31 May 1979
John Wiesenfeld 31 Jul. 1979 17 p refs
(Grant AF-AFOSR-3039-78; AF Proj. 2303)
(AD-A074089; AFOSR-79-0956TR) Avail: NTIS
HC A02/MF A01 CSCL 07/2

The oxidation of Ge and Sn by various gases including N2O, has been studied by flash photolysis at room temperature and the kinetics determined. The rate of Sn - N2O is probably too slow to permit construction of a chemical laser based on this reaction. A new set of techniques involving laser pumping of alkaline Earth atoms is also described, which will permit the study of the kinetic behavior of their low-lying excited levels in bimolecular collisions. GRA

N80-14388# Dayton Univ., Ohio.
DEVELOPMENT AND APPLICATION OF A LASER VELOCIMETER TO MEASURE VERY HIGH SPEED PARTICLE VELOCITIES Final Report, Nov. 1977 - Sep. 1978
James D. Trolinger Wright-Patterson AFB, Ohio AFFDL Jun. 1979 35 p refs Prepared in cooperation with Spectron Development Labs., Inc., Costa Mesa, Calif.
(Contract F33615-76-C-3145; AF Proj. 2404)
(AD-A073859; AFFDL-TR-79-3067) Avail: NTIS
HC A03/MF A01 CSCL 14/2

A laser velocimeter was developed for the measurement of the velocity of particles in the size range from 10 to 100 micrometers diameter and velocities up to 5000 meters per second. The instrument was successfully employed in accelerator tests which were conducted during the development of a reentry nose tip erosion and ablation facility. GRA

N80-14389# Aerospace Guidance and Metrology Center, Newark Air Force Station, Ohio.
LASER POWER METER INTERCOMPARISON TEST EVALUATED BY TWO VARIABLE LINEAR REGRESSION ANALYSIS Project Report, Apr. - Sep. 1978
Willie Blackmon 21 Sep. 1978 33 p refs
(AD-A074526; AGMC-79-001-1) Avail: NTIS
HC A03/MF A01 CSCL 14/2

This report describes how the data collected in a laser power meter exchange program between the Directorate of Metrology and Brook AFB, Texas is analyzed in determining the errors in the intercomparison measurement process. GRA

N80-14390# Naval Ocean Research and Development Activity, Bay St. Louis, Mo. Mapping, Charting and Geodesy Development Group.
OPERATING SCENARIO FOR A HYDROGRAPHIC AIRBORNE LASER SOUNDER (HALS) Interim Report
H. J. Byrnes May 1979 36 p refs
(AD-A073872; NORDA-TN-34) Avail: NTIS
HC A03/MF A01 CSCL 08/10

This note is intended to acquaint interested parties with the anticipated deployment of Hydrographic Airborne Laser Sounder (HALS). Data acquisition, data processing, data reduction rationale, data density, test results, and environmental considerations are covered. The document is intended primarily as presolicitation information for the HALS procurement. GRA

N80-14391# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Sciences.
STUDY OF TWO-PHOTON ABSORPTION AND AMPLIFICATION PROCESSES IN GASES Final Report, 1 Aug. 1976 - 30 Jun. 1979
Lorenzo M. Narducci 1 Sep. 1979 84 p refs
(Grant DAAG29-78-G-0098)
(AD-A074951) Avail: NTIS HC A05/MF A01 CSCL 07/4

This report summarizes our theoretical and experimental findings. It is divided into 8 sections. Section 1 contains a general description of the problem and a summary of the main results. Section 2 contains the theory of two-photon amplification. Section 3 details the requirements for the selection of an appropriate active medium. Section 4 describes the pumping requirements and the handling and preparation of the vapor cell. Section 5 contains a description of the curve of growth method which has been used in the work to measure the density of calcium vapor. Section 6 describes the details of operation of the pump dye laser and of the second harmonic generation. Section 7 contains a description of the construction and operation of the infrared dye laser. Section 8 contains a description and technical details of the timing circuitry used to fire the pump and probe lasers in a preassigned temporal sequence. GRA

N80-14392# Virginia Univ., Charlottesville. Dept. of Chemistry.
NEW LASER DYE SYSTEMS BASED ON LUMINESCENT TRANSITION METAL COMPLEXES Annual Report, 1 Jun. 1978 - 31 May 1979
James N. Demas 30 Jul. 1979 8 p refs
(Grant AF-AFOSR-3590-78; AF Proj. 2303)
(AD-A074245; AFOSR-79-0983TR) Avail: NTIS
HC A02/MF A01 CSCL 11/3

Excited state interactions of luminescent ruthenium (II) complexes with laser dyes are being studied. Novel experimental tools including an ultra high accuracy quantum counter comparator, a microcomputer controlled nanosecond risetime boxcar integrator, a luminescent wavelength shifter method for correcting for the wavelength dependence of phototube transit times in decay time measurements, and a step excitation method for studying reversible excited state electron transfer have been developed to facilitate these studies. Energy transfer from the tris(2,2'-bipyridine)-ruthenium(II) complex to a variety of rhodamine and oxazine laser dyes have been demonstrated in both homogeneous solutions and in micellar assisted ones. In favorable cases energy transfer efficiencies from the charge transfer (CT) sensitizing state of the Ru(II) complex to the singlet state of the laser dyes exceed 80%. To date, energy transfer appears to be dominantly by a Forster resonance mechanism. In the micellar cases, the dye and complex are brought so closely together that contact quenching of the excited dye singlet state can occur. Applications of these systems to new binary laser dyes are under study. GRA

N80-14393# California Univ., Berkeley.
INFRARED LASER WINDOW COATING BY PLASMA POLYMERIZATION Final Technical Report, 1 Mar. 1975 - 31 Aug. 1978
M. Shen Griffiss AFB, N.Y. RADC Jun. 1979 118 p refs
(Contract F19628-75-C-0097; ARPA Order 2415)
(AD-A075008; RADC-TR-79-149) Avail: NTIS
HC A06/MF A01 CSCL 11/3

This is the final report on the DARPA contract No. 19628-75-C-0097 on Infrared Laser Window Coating by Plasma Polymerization to prepare protective and anti-reflection coatings for infrared laser windows by depositing a thin film from the hydrocarbon plasma. The introduction section outlines state-of-the-art knowledge of plasma polymerization and the rationale of this approach. Next, the details of plasma polymerization of several simple saturated hydrocarbons were investigated. Here the radiofrequency glow discharge method was used as the method of generating plasma. The effect of changing the frequency of the plasma on one of the most promising monomers, i.e., ethane was investigated. Finally, the preferred method of preparing laser window coating, namely the plasma polymerization of ethane using pulsed radiofrequency plasma is investigated. GRA

N80-14394# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
FORWARD AND BACKWARD STIMULATED RAMAN SCATTERING IN A MULTIMODE FIBER
C. H. Lin, M. A. Nelson, B. B. Marshall, and J. K. Theobald 1978 17 p refs Presented at Phys. of Fiber Optics Conf., Kingston, R. I., 22 Jun. 1978
(Contract EY-76-C-08-1183)
(CONF-780688-2) Avail: NTIS HC A02/MF A01

Several orders of forward and backward stimulated Raman scattering were generated by a pulsed dye laser in a multimode step-index fiber. Frequency spectra and temporal profiles at different power levels are recorded and discussed. DOE

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-14395* National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS FOR ELECTROLYTICALLY TAPERED OR CONTOURED CAVITIES Patent
Lynn A. Williams, inventor (to NASA) (Anocut Engineering Co., Chicago) Issued 14 Nov. 1967 6 p Filed 17 Jan. 1966 Division of US Patent Appl. SN-90438, Filed 20 Feb. 1961, US-Patent 3,257,300 Sponsored by NASA
(NASA-Case-XNP-08835-1; US-Patent-3,352,774; US-Patent-Appl-SN-534931; US-Patent-Class-204-224) Avail: US Patent and Trademark Office CSCL 13I

An electrolytic machining apparatus for forming tapered or contoured cavities in an electrically conductive and electrochemically erodible piece is presented. It supports the workpiece and an electrode for movement relatively toward each other and has means for pumping an electrolyte between the workpiece and the electrode.

Official Gazette of the U.S. Patent and Trademark Office

N80-14396 Engineering Sciences Data Unit, London (England).
CHARACTERISTICS OF DISC SPRINGS IN COMBINATION (TO BE USED IN CONJUNCTION WITH ITEM NO. 78043)
Jul. 1979 10 p
(ESDU-79010; ISBN-0-85679-254-3; ISSN-0141-4089) For information on availability of series, sub-series and other individual data items, write NTIS, attn: ESDU, Springfield, Va. 22161. HC $290.50

A method is presented for calculating the load/deflection behavior of stacks of coned disc springs (Belleville washers). Guidance on calculation of the stiffness of spring stacks is also given. The stresses in the springs of a stack were calculated for critical springs in the stack. Three types of stacks are dealt with, namely regular stacks of identical springs, irregular stacks of identical springs and stacks of non-identical springs. Nested stacks are also covered. Notes are provided on the effect of friction on stack behavior and on ways of decreasing or increasing the friction losses in spring stacks under single stroke or low rate cyclic loading. ESDU

N80-14397* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ELECTROPHORETIC FRACTIONAL ELUTION APPARATUS EMPLOYING A ROTATIONAL SEAL FRACTION COLLECTOR Patent
Milan Bier, inventor (to NASA) Issued 9 Aug. 1977 12 p Filed 21 Dec. 1976
(NASA-Case-MFS-23284-1; US-Patent-4,040,940; US-Patent-Appl-SN-753103; US-Patent-Class-204-299R; US-Patent-Class-204-180G) Avail: US Patent and Trademark Office CSCL 13I

Electrophoretic fractional elution apparatus which has a column with a rotating seal joint is described. A thin jet of eluting buffer is directed across the lumen of the electrophoretic column in a direction perpendicular to that of electrophoretic migration. Either the content of the column is rotated with respect to the stationary jet, or the jet is rotated with respect to the column. The system may employ electrophoresis either in free solution or in packed columns.

Official Gazette of the U.S. Patent and Trademark Office

N80-14398* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COUPLING DEVICE FOR MOVING VEHICLES Patent
Arthur A. Rudmann, inventor (to NASA) Issued 6 Nov. 1979 11 p Filed 19 May 1978 Supersedes N78-25429 (16 - 16, p 2122)
(NASA-Case-GSC-12322-1; US-Patent-4,173,324; US-Patent-Appl-SN-907436; US-Patent-Class-244-161; US-Patent-Class-269-156; US-Patent-Class-294-86R; US-Patent-Class-294-113; US-Patent-Class-414-1) Avail: US Patent and Trademark Office CSCL 13I

A mechanical system is disclosed to capture and/or deploy a device or vehicle having relative motion with respect to another vehicle. The mechanism includes an onboard controlled collapsible iris assembly located at the end of a controlled manipulator system carried by one moving vehicle. The iris assembly by means of the manipulator system encircles a probe located on the other moving vehicle whereupon the iris assembly is activated and one or more iris elements close around the probe, thus capturing, and axially aligning the other vehicle with the iris assembly. Additionally, a rotator assembly is included for spinning the iris assembly in a manner adapted to engage the probe of a spinning vehicle. Deployment of the other vehicle is accomplished by reversing the capture procedure.

Official Gazette of the U.S. Patent and Trademark Office

N80-14399 Wisconsin Univ. - Madison.
MEASUREMENT OF FLUID MOTION IN A DIESEL ENGINE CYLINDER BY USE OF A TRACER GAS TECHNIQUE Ph.D. Thesis
Alfred Jacobsen Jessel 1979 268 p
Avail: Univ. Microfilms Order No. 7922809

A technique for measuring fluid motion in the cylinder of a fired or motored internal combustion engine was developed and tested. The method uses a rapid-acting valve to inject a small quantity of gaseous tracer at a specific position in the combustion chamber and at a specific time during each engine cycle. A short time after tracer injection, a similar valve extracts a small volume of cylinder gases at another specific location and time. Detection instrumentation analyzes the sampled gases for cycle-averaged tracer concentration and pure-tracer concentration. The data obtained showed the technique capable of quantifying swirl, squish, and piston-induced upward velocity. The effects of turbulent mixing forces were strongly manifested by the data.

Dissert. Abstr.

N80-14400*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SURFACE CONFORMING THERMAL/PRESSURE SEAL Patent Application
Martin L. Stevens, inventor (to NASA) (Fairchild Republic Co.) Filed 12 Dec. 1979 21 p Sponsored by NASA
(NASA-Case-MSC-18422-1; US-Patent-Appl-SN-102593) Avail: NTIS HC A02/MF A01 CSCL 11A

A sealing apparatus is described which serves both pressure and thermal sealing functions between adjacent and relatively movable elements of relatively large surfaces. The sealing apparatus has the flexibility required for large movable surfaces, and can accommodate moderate variations in the gap between such surfaces which may be affected by thermal distortion. Sealing is accomplished with a nonabrasive, low frictional material, creating as little resistance as possible to movement of control members and minimal wear and damage to surface coatings.

NASA

N80-14401# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OPTIMAL ROTATING COLUMN
Sarp Adali Mar. 1979 33 p refs
(CSIR-TWISK-76) Avail: NTIS HC A03/MF A01

The optimization of a column clamped to the rim of a wheel rotating at constant angular velocity is discussed. An optimal shape for a column of specified volume and minimum thickness and radius-to-length ratio is determined to maximize the critical rotational speed. In addition, the height-to-width ratio and thickness distribution of a uniform or optimal rectangular column are optimized so that the column buckles not only in the direction of one of the two principal axes, but assumes a buckled shape having displacement components along both axes. K.L.

N80-14402*# National Aeronautics and Space Administration, Washington, D. C.
PIPING AND TUBING TECHNOLOGY: A COMPILATION 1967 20 p
(NASA-SP-5903(01); C-67-03) Avail: NTIS HC A02/MF A01 CSCL 13K

Piping and tubing techniques which have potential industrial use are presented in summary form. R.E.S.

N80-14403*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SELF-ACTING LIFT-PAD GEOMETRY FOR CIRCUMFERENTIAL SEALS: A NONCONTACTING CONCEPT
Gordon P. Allen Jan. 1980 11 p refs
(NASA-TP-1583; E-154) Avail: NTIS HC A02/MF A01 CSCL 11A

A segmented circumferential seal with lift pads for hydrodynamic action was analyzed over ranges of speed and sealed pressure. Performance predictions, which predicted noncontact operation for speeds as high as 600 revolutions per second at sealed pressures to 86 N/sq cm, are discussed. Performance tests were performed on the seals and compared with the performance predictions. A.W.H.

N80-14404# University Coll. of Swansea (Wales). Tribology Centre.
LOW TEMPERATURE LUBRICATION
A. R. Lansdown and H. M. Briscoe 27 Apr. 1978 229 p refs
(Contract ESTEC-3284/77-NL-PP(SC))
(STC-78/376; ESA-CR(P)-1120) Avail: NTIS HC A11/MF A01

A survey intended to provide designers of spacecraft systems and other users with guidance to the selection of an appropriate lubrication system for any low temperature application is presented. The available published literature on low temperature lubrication is reviewed and summarized. Because the information is relatively sparse, it was supplemented by data on the fundamentals of tribology as related to low temperature and on the effects of low temperatures on materials. Guidance to lubricant selection in relation to specific low temperature situtions is given. A full bibliography is also provided. Author (ESA)

N80-14159*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STUDY OF THE INFLUENCE OF OIL SATURATION ON THE 64 METER ANTENNA HYDROSTATIC BEARING GROUT
H. P. Phillips, A. A. Riewe, M. Polivka (California Univ., Berkeley), and P. K. Mehta *In its* The Deep Space Network 15 Dec. 1979 p 62-70 (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-14405*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REACTOR FOR SIMULATION AND ACCELERATION OF SOLAR ULTRAVIOLET DAMAGE
E. Laue and A. Gupta 21 Sep. 1979 32 p Sponsored in part by DOE
(Contract NAS7-100; JPL Proj. 5101-35)
(NASA-CR-162533; JPL-Pub-79-92; DOE/JPL-1012-31) Avail: NTIS HC A03/MF A01 CSCL 14D

An environmental test chamber providing acceleration of UV radiation and precise temperature control (+ or -)1 C was designed, constructed and tested. This chamber allows acceleration of solar ultraviolet up to 30 suns while maintaining temperature of the absorbing surface at 30 C - 60 C. This test chamber utilizes a filtered medium pressure mercury arc as the source of radiation, and a combination of selenium radiometer and silicon radiometer to monitor solar ultraviolet (295-340 nm) and total radiant power output, respectively. Details of design and construction and operational procedures are presented along with typical test data. M.M.M.

N80-14406# Army Tropic Test Center APO, Miami 34004.
METHODOLOGY INVESTIGATION EXPOSURE/PERFORMANCE TEST OF SELECTED MATERIEL ITEMS Final Report, Jul. 1973 - Apr. 1975
George F. Downs and Robert J. Gorak Jan. 1979 74 p refs
(AD-A074001; USATTC-7901) Avail: NTIS HC A04/MF A01 CSCL 15/3

USATTC conducted a methodology investigation in the Canal Zone from July 1973 to April 1975 to study the relationships among performance of materiel, exposure, and materials deterioration. Representative items of Army materiel were selected, exposed in different modes in the humid tropics, and performance tested at regular intervals. Objectives were to learn how and when to measure performance, to relate the performance measures to materiel deterioration, and to learn how and when to apply nondestructive test (NDT) techniques. The pallet and tarpaulin-forest storage mode provided the most severe environment. Use of this storage mode in tropic surveillance tests will uncover materiel design weaknesses more rapidly than other common long-term storage modes. In general, exterior visible evidence of material degradation should not be used for item performance predictions. Test items exposed in the humid tropics should be performance tested and fully disassembled and examined to determine the full extent of tropic deterioration. Further studies are required to investigate techniques for quantifying the severity of microbial attack and distinguishing between destructive and nondestructive growth. Meaningful application of NDT techniques to test items during tropic surveillance testing requires further refinement. An investigation should be undertaken to examine state-of-the-art NDT techniques for application to tropic testing. GRA

N80-14407# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
ULTRAVIOLET SPECTROSCOPIC METHODS FOR QUALITY CONTROL
G. D. Simpson Apr. 1979 8 p refs
(Contract DE-AC04-76DP-00487)
(MHSMP-79-29) Avail: NTIS HC A02/MF A01

A test designed to provide instrumental quality control on the Perkin-Elmer 356 Double Wavelength Spectrophotometer is described. Properly implemented, this test provides a routine check on instrument performance, so that repair or adjustment can be made with a minimum loss of instrument downtime and of precision and accuracy in UV measurements. Results of the test are given. DOE

N80-14408# Oak Ridge National Lab., Tenn.
ULTRASONIC FLAW DETECTION AND CHARACTERIZATION IN STRUCTURAL MATERIALS BY SPECTRAL ANALYSIS
L. Adler, K. V. Cook, W. A. Simpson, D. K. Lewis, and D. W. Fitting Oct. 1978 26 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6456) Avail: NTIS HC A03/MF A01

A method of quantitavely determining size and location of simulated flaws in anisotropic materials such as stainless steel welds is described. Previous work demonstrated that spectral analysis of a broad-band ultrasonic pulse scattered from a defect can be used to determine its size orientation in isotropic materials if the velocity of sound in the materials is known. In an anisotropic structural material, stainless steel weld, centrifugally cast pipe, the velocity of sound, both shear and longitudinal, depends on the sound's direction. When anisotropy is not taken into account, defect location and size are frequently misjudged. The effect of this structural variation in materials must be considered to obtain the correct size and location of defects by frequency analysis. A theoretical calculation, including anistropy, of the scattered field from defects is also presented. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N80-14409 Oklahoma State Univ., Stillwater.
BIAXIAL BENDING ANALYSIS OF HYDRAULIC CYLINDERS

Ph.D. Thesis
Narayanarao Ravishankar 1979 147 p
Avail: Univ. Microfilms Order No. 7928229

A method of analysis which permits the investigation of stresses and deflections in a hydraulic cylinder was developed using a finite element analytical model to represent the actual structure. The hydraulic cylinder is modeled as an assemblage of space-frame elements with a fictitious rotary spring at the gland to take the crookedness angle effect into account. The influencing factors included are: the self-weight of the system, variation of the crookedness angle at the sliding connection, eccentricity of supports and of axial loads at any point along the length of the cylinder in any arbitrary direction, and the presence of external moments at any arbitrary point along the cylinder. The analysis is applicable to cylinders with hollow or solid rods, with or without fluid pressure. A computer program is also presented. Dissert. Abstr.

N80-14410 Purdue Univ., Lafayette, Ind.
ACOUSTIC EMISSION: AN APPLICATION TO FRACTURE MECHANICS Ph.D. Thesis
Ronnie Keith Miller 1979 156 p
Avail: Univ. Microfilms Order No. 7926413

A practical theory was developed for analyzing the acoustic emissions from various engineering materials. An experimental system used to detect and record acoustic emissions was created in order to validate the proposed theory. Methods for reducing background noise as optional system features are introduced as well as the establishment of the Master Curves for different materials. Methods for measuring acoustic emission counts and the acoustic emission count rate (using threshold techniques) are also outlined. A theory is proposed relating acoustic emissions from Double-Edge-Cracked plates to the stress intensity factor and the crack length. Tests results from Aluminum 6061-T4, Cast Acrylic and Aluminum 2024-T3 DEC specimens are compared with theoretical predictions showing a close correlation. Dissert. Abstr.

N80-14411 Northwestern Univ., Evanston, Ill.
AN X-RAY STUDY OF THE REGION AROUND STATIC AND FATIGUE CRACKS Ph.D. Thesis
William Hillel Schlosberg 1979 247 p
Avail: Univ. Microfilms Order No. 7927442

The Warren-Averbach method of Fourier analysis of X-ray diffraction profiles was employed successfully in combination with a microbeam to observe the local deformation behavior attendant to a fatigue crack to obtain information about the structure of deformed metals. The plastic region and its surroundings were studied. Residual stress measurements with X-rays were also made to study the elastic response of the cracked samples. In both instances the effects of statically applied loads and fatigue loads were examined. The two-dimensional nature of each quantity was determined using a mini-computer controlled diffractometer. Dissert. Abstr.

N80-14412 Oklahoma State Univ., Stillwater.
A STUDY OF SURFACE ZONE DETERIORATION OF NICKEL LEADING TO FATIGUE CRACK INITIATION IN LOW CYCLE FATIGUE Ph.D. Thesis
Jesa H. Kreiner 1979 172 p
Avail: Univ. Microfilms Order No. 7928217

The effects of subjecting 35 specimens of fully annealed Nickel 200 material to completely reversed bending and the surface changes prior to crack initiation were observed. It was shown that a predictable pattern of hardening occurs in different surface strata. The pace of hardening decreased with the cycling. Some hardness values were obtained within the grains and at grain boundaries. Nickel 200 exhibited a planar slip behavior. Relationships describing hardening rates were developed. The material close to the surface plastically deformed more heavily than the material within. Dissert. Abstr.

N80-14413# National Aerospace Lab., Amsterdam (Netherlands).
FLIGHT SIMULATION FATIGUE TESTS ON LUGS WITH HOLES EXPANDED ACCORDING TO THE SPLIT-SLEEVE COLD WORK METHOD
J. Schijve, F. A. Jacobs, and A. E. Meulman 21 Nov. 1978 56 p refs
(NLR-TR-78131-U; ICAF-1104) Avail: NTIS HC A03/MF A01

Flight simulation tests were performed on 2024-T3 and 7075-T6 lug specimens. Geometrical distortions induced by the expansion were measured. The significance of residual stresses was analysed with reference to depth of penetration of cold work, the relaxation of residual stress by cyclic loads, and other practical aspects. The results indicated that significant fatigue life improvements were obtained with the split-sleeve method. K.L.

N80-14414# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
UNIFIED FORMALISM OF STRAIN AND STRESS
R. Roesal Mar. 1979 16 p
(CSIR-TWISK-77) Avail: NTIS HC A02/MF A01

The classical analysis of stress and strain pertaining to "infinitesimal" deformations of arbitrary continuous bodies is reviewed. The concept of an exact sequence of sets and operators is introduced and the sequence diagram is presented as a mnemonic device embodying several theorems in one concept. K.L.

N80-14415# Naval Postgraduate School, Monterey, Calif.
VIBRATION ANALYSIS AND NONDESTRUCTIVE TESTING USING DOUBLE-EXPOSURE HOLOGRAPHIC TECHNIQUES M.S. Thesis
John Michael Fahey Jun. 1979 112 p refs
(AD-A073457) Avail: NTIS HC A06/MF A01 CSCL 20/11

Double-exposure holograms were made of aluminum 2024-T4 rectangular plates. The double-exposure technique was applied to an aluminum plate in a nonflawed and then a flawed condition. Results of these experiments, comparing the effects at various resonant frequencies, were then compared with results previously obtained in other studies to ascertain their applicability to Naval Engineering. The plate was then flawed with a 1 inch through-thickness vertical slit, and double-exposure holograms were generated. The resonant frequencies of the flawed plates were recorded, and the mode shape deviations were analyzed. A comparison was made of resonant frequencies and mode shapes of flawed and nonflawed plates to determine the applicability of holographic procedures to nondestructive testing of vibrating mechanical parts. Results of the experiments indicate that holographic nondestructive testing (HNDT) of vibrating objects in a shipboard environment holds promise for future applications. Further research is required to develop systems for use aboard ships. These procedures are being used successfully in the aerospace industry and automobile manufacturing. GRA

N80-14416# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
OFF-CENTER, LOW VELOCITY, TRANSVERSE NORMAL IMPACT OF A SIMPLY SUPPORTED PLATE Final Report
Richard E. Uorens and Edward J. McQuillen 11 Sep. 1979 61 p refs
(AD-A074946; NADC-79215-60) Avail: NTIS HC A04/MF A01 CSCL 14/2

A theoretical solution for the response of a simply supported plate to off center low speed transverse impact is presented. This solution is empirically corrected, on the basis of viscoelastic beam analysis, to admit damping. Comparison of the numerical predictions of the corrected theory with central impact test results on graphite-epoxy composite laminates shows good agreement. The structural dynamic response model consists of a special orthotropic plate impacted by a rigid mass. Initial displacement and velocity distributions were assumed and the solution method utilized the finite Fourier sine transform and Laplace transforms with respect to both space and time. GRA

N80-14417# AiResearch Mfg. Co., Phoenix, Ariz.
CONTACT STRESS ANALYSIS OF CERAMIC-TO-METAL INTERFACES Final Report
David G. Finger 21 Sep. 1979 35 p refs
(Contract N00014-78-C-0547)
(AD-A074491; AiResearch-21-3239) Avail: NTIS HC A03/MF A01 CSCL 14/2

The objective of this proposed 8-month program was to conduct analysis, specimen testing, and data correlation to provide

an improved understanding of the local contact conditions that prevail at an interface between ceramic and metal components for gas turbine engines. The program was specifically directed to study contact stresses at the interface between inserted ceramic turbine blades (hot-pressed silicon nitride) and a metal rotor, but the method of analysis, results, and conclusions also provided a better understanding of contact stresses at ceramic-to-metal and ceramic-to-ceramic interfaces for static components. A finite-element stress analysis procedure and structural evaluation technique consistent with the statistical nature of ceramic materials was generated. Specimen testing was conducted to obtain validation of these techniques and provide insight as to possible modifications of stress simulation or fracture prediction criteria. The objective was to develop a design methodology, which will improve on current design methods, thus permitting the design of interface configurations in which strengths more indicative of the inherent strength of ceramic materials can be realized. GRA

N80-14418# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
CUMULATIVE DAMAGE UNDER TWO LEVEL CYCLING, SOME THEORETICAL PREDICTIONS AND TEST DATA
Zvi Hashin (Tel Aviv Univ., Israel) and Campbell Laird 15 Aug. 1979 16 p refs
(Contract N00014-78-C-0544)
(AD-A074488; TR-3) Avail: NTIS HC A02/MF A01 CSCL 12/2

Predictions of a new cumulative damage theory established by Hashin and Rotem (HR) are compared with an extensive series of test data for two-level shear strain cycling and a double linear exponential damage rule, all given by Miller and Zachariah (MZ), demonstrating good agreement. While MZ requires determination of parameters by fit to the two level test data, the only testing parameter needed for HR is the fatigue lifetime N_0 beyond which the fatigue limit occurs. This parameter has here been estimated on the basis of recent advances in understanding cyclic deformation. GRA

N80-14419# California Univ., Livermore. Lawrence Livermore Lab.
PHOTOACOUSTIC STRESS
A. Rosencwaig and J. F. Scheimer 13 Apr. 1979 8 p refs Presented at Topical Meeting on Photoacoustic Spectry., Ames, Iowa, 1 Aug. 1979
(Contract W-7405-eng-48)
(UCRL-82594; CONF-790819-1) Avail: NTIS HC A02/MF A01

The theory for photoacoustic-induced stress in condensed media is developed for both near-field and far-field conditions. DOE

N80-14420# Sandia Labs., Albuquerque, N. Mex.
TRIAXIAL MEASUREMENT OF STRESS WAVES IN THE FREE-FIELD
R. P. Reed 1979 22 p refs Presented at the Transducer Workshop, Colorado Springs, 12 Jun. 1979
(Contract EY-76-C-04-0789)
(SAND-78-2123C; CONF-790635-3) Avail: NTIS HC A02/MF A01

The characteristics of the dynamic stress fields are presented along with the response of sensors to triaxial loading. Described is a prototype gage being developed for general field application where triaxial measurement is required. DOE

N80-14421# General Atomic Co., San Diego, Calif.
MODIFIED WEIBULL THEORY FOR THE STRENGTH OF GRANULAR BRITTLE MATERIAL
F. Ho May 1979 27 p refs
(Contract DE-AT03-76ET-35300)
(GA-A-15228) Avail: NTIS HC A03/MF A01

A modified Weibull theory was developed to describe the strength of a granular brittle material. The statistical aspect of the strength for practical application of the theory is discussed. The Weibull distribution is briefly reviewed and tensile versus bend strength is discussed. Observations and results are summarized. R.C.T.

N80-14422# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
REVIEW OF INVESTIGATIONS INTO AERONAUTICS RELATED FATIGUE FEDERAL REPUBLIC OF GERMANY Status Report, May 1977 - Apr. 1979
D. Schutz and O. Buxbaum 1979 166 p refs Presented at 16th Conf. of Intern. Comm. Aeron. Fatigue, Brussels, 1979
(LBF-S-142; ICAF-CONF-1979) Avail: NTIS HC A08/MF A01

Investigations into fatigue and fatigue related disciplines, as they regard aeronautics, are reviewed. Studies treated are limited to those carried out in the Federal Republic of Germany. Subjects include measurement and analysis of operational loads, fatigue behavior of joints and notched specimens, fatigue life prediction, cyclic stress-strain behavior, and low cycle fatigue. Also considered are crack propagation, fracture mechanics, and residual static strength. Fatigue of fiber reinforced plastics and hybrid structures as well as some investigations of general interest with and without relation to aircraft are reported on. Finally, a bibliography of fatigue related documents by German authors is given.
Author (ESA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see *35 Instrumentation and Photography*.

N80-14423* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COAL-SHALE INTERFACE DETECTION SYSTEM Patent
Richard A. Campbell, Jerry L. Hudgins, Paul W. Morris, Harry Reid, Jr., and Joe E. Zimmerman, inventors (to NASA) Issued 12 Jun. 1979 9 p Filed 3 Nov. 1977
(NASA-Case-MFS-23720-2; US-Patent-4,157,655; US-Patent-Appl-SN-848421; US-Patent-Class-73-12; US-Patent-Class-73-82) Avail: US Patent and Trademark Office CSCL 08I

A coal-shale interface detection system for use with coal cutting equipment consists of a reciprocating hammer on which an accelerometer is mounted to measure the impact of the hammer as it penetrates the ceiling or floor surface of a mine. A pair of reflectometers simultaneously view the same surface. The outputs of the accelerometer and reflectometers are detected and jointly registered to determine when an interface between coal and shale is being cut through.
Official Gazette of the U.S. Patent and Trademark Office

N80-14424 State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
THE MAPPING OF IMPORTANT FARMLAND USING REMOTE SENSOR AND SOCIO-ECONOMIC VARIABLES Ph.D. Thesis
Jon Laurence Roberts 1979 233 p
Avail: Univ. Microfilms Order No. 7920317

A comprehensive digital data base of physical (land use) and socio-economic (zoning, agricultural districts, rental/ownership patterns) factors important to farming was created. LANDSAT land use data was collected over the Ontario County, New York study area and grouped into agriculture and forest classes. The socio-economic data was converted to an image-based format by causing the outlines of zones and districts to be digitized and filled in with pixels of a certain grey level. These images are then stored to create the data base. An accuracy check was made on the LANDSAT data using a color infrared U-2 image of the study area. A spectral land use classification was also

performed using digitized U-2 data. LANDSAT classification accuracy is 64% correct for the forest class. U-2 classification accuracy is 82% correct for the forest class. Dissert. Abstr.

N80-14426# Forest Service, Washington, D. C.
FORESTER'S GUIDE TO AERIAL PHOTO INTERPRETATION
Agriculture Handbook no. 308
Thomas Eugene Avery Nov. 1978 47 p refs
Avail: NTIS HC A03/MF A01

A practical reference on techniques of aerial photo interpretation in forest inventory is provided. While oblique photographs are occasionally useful for interpretation, this manual emphasizes stereoscopic interpretation of vertical aerial photographs available from various agencies of the U.S. Department of Agriculture.
A.R.H.

N80-14428# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
SCANLINE: A COMPUTER PROGRAM FOR CONVERTING RASTER MAPS INTO LINE MAPS
C. S. M. Mueller and A. H. J. Christensen Sep. 1978 42 p refs
(CSIR-TWISK-43) Avail: NTIS HC A03/MF A01

A computer program, algorithms and techniques are described that can be used for transforming a map digitized on a raster scanner, in bit matrix form, into a line map represented by a set of vectors, which is a format very suitable for processing by computer. By means of such a program and techniques of this kind, the conversion of a very large number of existing cartographic maps into digital line maps becomes economically feasible. Author

N80-14427# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany). Abt. 2 des Deutschen Geodaetischen Forschungsinstituts.
INFORMATION ON CARTOGRAPHY AND GEODESY. SERIES 1: ORIGINAL REPORT NUMBER 75
1978 218 p refs In GERMAN; ENGLISH summary Original contains color illustrations
Avail: NTIS HC A10/MF A01

Cartography and problems related to it are discussed. Quantification of syntactic symbols, automation of map drawing, computer programs developed for cartographic data processing, geographic information systems, data bases, generalization algorithms, and programs for automatic pattern recognition are included. For individual titles, see N80-14428 through N80-14439.

N80-14428# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
QUANTIFICATION OF SYNTACTIC INFORMATION CONTENT IN GRAPHICS USED FOR SOCIAL EMPIRICAL RESEARCH [QUANTIFIZIERUNG SYNTAKTISCHER ZEICHENINFORMATIONEN IN KARTEN FUER SOZIALEMPIRISCHE UNTERSUCHUNGEN]
Juergen Bollmann *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 9-32 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The information theoretical analysis procedure presented is based on the fact that in cartography the faculty of perception of user groups has to be studied by means of social empirical methods. When test patterns are necessary the information content has to be quantified. An analysis procedure is shown which quantitatively describes syntactic symbol characteristics. In this process, the computed information values can very simply be correlated with time parameters or with other interpretations.
Author (ESA)

N80-14429# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GRAPHICAL PROCESSING OF AREAL RELATED DATA. PROGRAM DEVELOPMENT DONE IN NORDRHEIN-WESTFALEN [FLAECHENBEZOGNE GRAPHISCHE DATENVERARBEITUNG -PROGRAMMENTWICKLUNG BEIM LANDESVERMESSUNGSAMT NORDRHEIN-WESTFALEN]
Heinz Brueggemann *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 33-49 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The automatic processing of areal related data requires a data structure which assists an areal proceeding. The subdivision of digitized areal data by means of a raster in combination with the realization of a graph structure for geometry and topology permits a simplification of such cartographic applications as digitizing, generalization, preparation of drawings, and computation of surfaces. Interactive correction possibilities are realized in a program adapted to this structure. Author (ESA)

N80-14430# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PROGRAM CONTROLLED CARTOGRAPHIC GENERALIZATION OF BUILDINGS, FOR 1:25000 TOPOGRAPHIC MAPS [PROGRAMMGESTEUERTE G FUER DIE TOPOGRAPHISCHE KARTE 1:25000]
Ernst-Dietrich Hoffmeister *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 51-62 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The results obtained by the program controlled cartographic generalization of large scale representations of buildings are presented. In addition to the capture of automation-compatible original data by digitizing available maps, the possibilities of applying a program system composed of modules demonstrated by a large capacity computer and an automation system for cartography are described. Finally, the programmed algorithms for the automatic processing of the basic rules of generalization (select, enlarge, simplify and merge) are discussed, illustrating them by means of plotter drawings of an automatically generalized representation of buildings. Author (ESA)

N80-14431# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AN INTERACTIVE EDITOR FOR CARTOGRAPHIC DATA [EIN INTERAKTIVER EDITOR FUER KARTOGRAPHISCHE DATEN]
W. Kleinoeder *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 63-76 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The concept and implementation of an editor for cartographic data are described. The EPIK program for interactive cartography is reviewed, and the main functions of the editor program are discussed. The implementation as part of an information system requires that the data bank system permit access to particular objects as well as access to particular regions. Author (ESA)

N80-14432# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
OVPREC: A PROGRAM AUTOMATIC RECOGNITION OF OVERLAPPING ZONES OF BROADENED CARTOGRAPHIC LINE ELEMENTS [OVPREC - EIN PROGRAMM ZUR AUTOMATISCHEN ERKENNUNG DER UEBERLAPPUNGSSTELLEN VERBEITERTER LINIENHAFTER KARTENELEMENTE]
Roland Schittenhelm *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 77-83 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The program OVPREC, which is implemented in a cartographic automation system enabling a computer to find the overlapping zones of broadened cartographic line elements without external help, is described. As a recognition algorithm, OVPREC preceeds a displacement algorithm, which disentangles the overlapping zones found with the help of OVPREC. The conditions of the application of OVPREC and the program structure, as well as the functioning of the subroutines are surveyed. As a result, a vector contsining the coordinates of the intersection points of the broadened line elements which overlap the keys of these elements as well as the number 0 or 1, depending on whether

the overlap begins or ends in that point, are obtained.
Author (ESA)

N80-14433# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CARTOGRAPHIC AUTOMATION STATUS IN A GERMAN HYDROGRAPHIC INSTITUTE [STAND DER AUTOMATION IN DER KARTOGRAPHIE DES DEUTSCHEN HYDROGRAPHISCHEN INSTITUTS]
Karl-Wilhelm Schrick *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 85-91 ref In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

For several years hydrographic surveying data have been largely obtained automatically and evaluated for the compilation or correction of charts. The numerically controlled drafting table Aristomat 8446, drafts and subdivides chart borders, represents hyperbolic lattices and enters figures. The recently acquired interactive digitizing table, Aristogrid CD 400, now enables the digitalization of chart contents for inclusion on new charts.
Author (ESA)

N80-14434# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ESTABLISHMENT OF A DATA BASE OF THE ADMINISTRATIVE BOUNDARIES OF GERMANY, SCALE 1:500,000 TO 1:1,000,000 [AUFBAU EINER DATENBANK FUER VERWALTUNGSGRENZENKARTEN IM MASSTAB 1:5000,000 BIS 1:1,000,000]
Helmut Ulrig *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 93-105 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

The establishment of a data base of the administrative boundaries of the Federal Republic of Germany is described. First, the data are captured on punch tapes, then read into a data base on magnetic disks and processed interactively. Errors are eliminated, data updated and, furthermore, the statistical code numbers of the rural districts have been added as a supplementary description.
Author (ESA)

N80-14435# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GENERALIZATION ALGORITHMS [ALGORITHMEN ZUR GENERALISIERUNG]
Jens Volkert *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 111-132 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

A method is described for automatic generalization subject to the condition that the maps produced have to be suitable for the interactive information system EPIK. The method satisfies all the cartography requirements, reducing the given data element lengths to one of the standard raster polygonal element lengths given in preestablished 4:1 ratios.
Author (ESA)

N80-14436# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THREE TYPES OF GEOGRAPHIC DATA STRUCTURE: SIMILITUDES, DIFFERENCES, AND POSSIBLE SYNTHESIS [DREI TYPEN GEOGRAPHISCHER DATENSTRUKTUREN: GEMEINSAMKEITEN, UNTERSCHIEDE UND EINE MOEGLICHE SYNTHESE]
Wigand Weber *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 133-157 refs In GERMAN; ENGLISH summary Presented at Adv. Study Symp. on Topological Data Struct. for Geograph. Inform. Systems, Dedham, Mass., Oct. 1977 (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

Map data structures and their direct descendants are described along with the relations among them and with general principles of data base theory using CODASYL and Relational Model concepts as a base. The three types of data structures are: the polygonal data structure, which is based on two binary relations between the polygons and the modes of a planar boundary graph; the intersection graph data structure, describing intersections of features explicitly; and the gridded data structure, which contains relevant relations mostly in an implicit manner. Finally, attention is drawn to a fourth data structure, which essentially consists of a hierarchy of nested squares of different sizes superimposed on the map. This hierarchy is described by a binary tree, the branches of which contain the pool addresses of the linearly represented map features passing through the respective squares.
Author (ESA)

N80-14437# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GEOGRAPHIC INFORMATION SYSTEMS: A REVIEW, WITH DISCUSSION OF FUTURE DEVELOPMENTS [GEOGRAPHISCHE INFORMATIONSSYSTEME - EIN UEBERBLICK UND GEDANKEN ZUR WEITEREN ENTWICKLUNG]
Wigand Weber *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 159-186 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

A geographic information system (GIS) comprises locally related data in digital form. The user can interrogate such data selectively or results derived from them. The characteristics of a GIS are described, including its contents, its data structure, its possible evaluations, the algorithms used for that purpose, and the data processing installations, on which it runs (hardware). These characteristics are examined with regard to the conceptual fundamentals, where, as far as possible, alternatives are critically compared with the aim of drawing conclusions for the future development. The problems of standardization, data capture, economy, and exchange of experience in this field are also discussed.
Author (ESA)

N80-14438# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A PROGRAM FOR THE DESIGN OF GEOGRAPHICAL MAPS [EIN PROGRAMM ZUM ENTWERFEN UND ZEICHNEN GEOGRAPHISCHER NETZE]
Ingo Wilski *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 187-200 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

A FORTRAN program for the design of geographical maps in the form of the presentation of the Earth's graticule and/or additional topographical information was developed. The characteristics and implementation of the program are described. Thirteen different projections are already available.
Author (ESA)

N80-14439# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AN ALGORITHM FOR THE LINEARIZATION OF RASTER IMAGES FOR MINICOMPUTERS [EIN ALGORITHMUS ZUR LINEARISIERUNG VON RASTERBILDERN FUER MINICOMPUTER]
Gerd Woetzel *In its* Inform. on Cartography and Geodesy. Ser. 1: Original Rept. No. 75 1978 p 201-210 refs In GERMAN; ENGLISH summary (For primary document see N80-14427 05-43)
Avail: NTIS HC A10/MF A01

Some results obtained when capturing automatically line structures by means of the raster scan method are presented. The algorithm used for the linearization is described. Finally, the possibility of implementation on minicomputers is pointed out.
Author (ESA)

N80-14440# European Space Agency, Paris (France).
SATELLITE REMOTE SENSING: APPLICATIONS IN AGROCLIMATOLOGY AND AGROMETEOROLOGY
Eric C. Barrett, ed. (Bristol Univ.) 1979 177 p refs Proc. of lectures of Joint ESA/Food and Agr. of UN/WMO Intern. Training Course, Rome, 2-13 Oct. 1978
(ESA-SP-1020; ISSN-0379-6566) Avail: NTIS HC A09/MF A01

The principles and potentials of satellite remote sensing as applied to agroclimatological and agrometeorological techniques

are considered. Major subjects of discussion include the theory behind remote sensing instrumentation and the interpretation of satellite observations. Various remote sensing programs are covered, such as the Earthnet program and the Agro-Ecological Zones Project. Also presented are numerous mathematical models which can be readily used with inputs of satellite imagery data. For individual titles, see N80-14441 through N80-14457.

N80-14441# Food and Agriculture Organization of the United Nations, Rome (Italy). Plant Production and Protection Div.
OVERVIEW OF AGROMETEOROLOGY
Michel Frere *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 3-7 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

Agrometeorology, a branch of science which aims at using meteorological information to develop quantitatively and improve qualitatively the products of agriculture by taking maximum advantage of the favorable aspects of climate and minimizing the harmful effects of weather, is reviewed. Strategic aspects of agrometeorology, affecting long term planning of agriculture when envisaging agricultural projects or crop diversification in a given area, are considered. Tactical aspects of agrometeorology, concerning the short term influences of day to day weather on the development of crops and the evolution of their yield, are also discussed. Emphasis is placed on the interdisciplinary aspect of agrometeorology. Author (ESA)

N80-14442# Food and Agriculture Organization of the United Nations, Rome (Italy). Remote Sensing Unit.
OVERVIEW OF REMOTE SENSING FOR AGRICLIMATOLOGY AND AGROMETEOROLOGY
John A. Howard *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 8-13 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The evolution of civilian applications of satellite remote sensing is reviewed. Emphasis is on the greater availability of sensing equipment and the application of more readily obtainable data to agrometeorology as well as to agroclimatology. A forward look into the development of satellite remote sensing is offered, considering Earth resources satellites and environmental satellites. It is shown that good data on land surfaces, ocean surfaces, clouds, and atmospheric composition are now at the disposition of researchers and that emphasis should be placed on improving the quality and uniformity of these data. Author (ESA)

N80-14443# Food and Agriculture Organization of the United Nations, Rome (Italy). Remote Sensing Unit.
PHYSICAL BACKGROUND OF REMOTE SENSING
W. D. Langeraar *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 14-19 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The physical principles of remote sensing are reviewed. After a brief discussion of the evolution of sensory data acquisition and interpretation, instruments, such as infrared detectors, seismometers, geiger-counters, and magnetometers, are considered. Emphasis is on the role of electromagnetic radiation in the detection of signals which would otherwise not be perceivable by human senses. Multispectral scanning data, like that available from LANDSAT, is taken as an example and spectral signatures are discussed. Finally, the spectral bands utilized by METEOSAT are also briefly treated. Author (ESA)

N80-14444# European Space Agency, Paris (France). Directorate of Planning and Future Programmes.
THE EARTHNET PROGRAMME
L. Mareli *In its* Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 20-27 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

A European network for the acquisition, preprocessing, archiving, and distribution of remote sensing satellite data is decribed. Emphasis is placed on distribution of LANDSAT data and increased utilization of space derived remote sensing imagery. Establishment of a basic capacity to handle data from both American and European remote sensing satellites, to provide high standard products tailored to the needs of users, and to include second generation remote sensing missions such as LANDSAT-D, Seasat-B and C, space shuttle based remote sensing experiments, and planed European remote sensing missions for the first Spacelab flight is outlined. J.M.S.

N80-14445# Food and Agriculture Organization of the United Nations, Rome (Italy).
THE AGRO-ECOLOGICAL ZONES PROJECT
A. H. Kassam IN ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 32-33 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

An estimate is made of what the production of the world's arable lands must be to support the world population in the year 2000. Different crops with widely varying climatic and soil requirements as well as different levels of agricultural technology are reviewed in order to assess the real world food production potential. The eleven crops considered are pearl millet, sorghum, maize, rice, wheat, phaseolus bean, soybean, cassava, sweet potato, white potato, and cotton. Results include a generalized map of agroclimatic suitability for the various crops and a land suitability assessment. Author (ESA)

N80-14446# Food and Agriculture Organization of the United Nations, Rome (Italy). Remote Sensing Unit.
REMOTE SENSING APPLIED TO AGRICULTURE
J. A. Howard IN ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 36-42 ref (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The ways in which remote sensing can be used to assist in providing information useful to food production are considered. In this respect remote sensing for agricultural crop estimates is seen as one of the most important inputs. The diagnostic characteristics used in analying remote sensing imagery, whether airborne or obtained by an Earth resources satellite, are discussed. They are summarized according to the type of sensing being undertaken. The formulation of agricultural crop estimates in then shown. Author (ESA)

N80-14447# Environmental Analysis and Remote Sensing, Delft (Netherlands).
THE APPLICATION OF THERMAL INFRARED REMOTE SENSING DATA TO SOIL MOISTURE AND EVAPORTATION DETERMINATION
I. A. Rosema *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 46-59 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The time and weather conditions that favor the extraction of information on soil moisture and evaporation from thermal imagery are discussed. Mathematical models of the relations in question are presented along with an algorithm for the interpretation of remotely sensed surface temperature imagery. Fields of application and the need for ground truth data are discussed. Application of the algorithm to crop irrigation is discussed. J.M.S.

N80-14448# European Space Operations Center, Darmstadt (West Germany). Meteosat Data Management Dept.
METEOSAT AND REMOTE SENSING APPLICATION
K. G. Lenhart *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 61-72 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The main characteristics of Meteosat and its associated ground system are described. The spacecraft orbit and attitude, mission objectives, and radiometer capabilities and image processing on the ground are discussed along with near real time image dissemination and the data collection platform sub-system. Remote sensing applications of Meteosat data are surveyed. J.M.S.

N80-14449# European Space Agency, Paris (France).
THE ESA REMOTE SENSING PROGRAM: PRESENT ACTIVITIES AND FUTURE PLANS
J. Plevin and I. Pryke *In its* Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 74-87 refs Presented

at ISP/IUERO Symp., Freiburg, July 1978 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The activities of the European Space Agency (ESA) concerning access to and development of remote sensing facilities are reviewed. European regional needs and priorities are emphasized, but aid programs to developing countries are also envisaged. Preparation of remote sensing experiments for use in Spacelab is discussed. The development of a metric camera and the microwave remote sensing experiment scheduled for the First Spacelab Payload are cited as examples. The organization of the Earthnet Program is then covered and ESA studies relating to the definition of other remote sensing satellite systems are summarized. Author (ESA)

N80-14450# Land Resource Research Inst., Ottawa (Ontario).
CROP WEATHER MODELS: CONCEPTS AND APPLICATIONS
W. Baier *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 88-93 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

Various crop-weather analysis models are presented in order to illustrate the role of agrometeorology in scientific crop development. Those models presented include factorial yield models, empirical statistical yield models, and associated sub-models used in crop growth simulation studies. The separation of technological change from meteorological variability is then treated. An example showing time trends and weather variables in a multiple curvilinear regression analysis performed on data taken on the state of Illinois is cited. Finally, possible applications of crop-weather models are briefly assessed. Author (ESA)

N80-14451# Joint Research Centre of the European Communities, Ispra (Italy).
AGROCLIMATOLOGICAL METHODS INVOLVING REMOTE SENSING TECHNIQUES
G. Fraysse *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 94-115 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The application of remote sensing techniques to agrometeorology and crop monitoring is considered with emphasis on improving the agricultural productivity of developing countries. The data requirements for crop monitoring and yield forecasting models are discussed. The performance of Earth observation satellites and the advantages of the data collecting systems of the satellites are given. J.M.S.

N80-14452# Bristol Univ. (England). Climatology and Remote Sensing.
CROP ENVIRONMENT MONITORING: THE REMOTE SENSING SYSTEMS
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 116-120 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

Aircraft and LANDSAT imagery are evaluated for their usefulness in environmental monitoring programs. The favorable and unfavorable characteristics of weather satellite operations in this application are then outlined. A list of weather satellite systems which could contribute to crop environment monitoring is also given. Finally, the participation of weather satellites in international and national monitoring programs is reviewed. Author (ESA)

N80-14453# Bristol Univ. (England). Climatology and Remote Sensing.
PRACTICAL EXERCISE ON THE ANALYSIS OF VISIBLE AND INFRARED IMAGES FROM NOAA-5
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 121-126 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

A satellite nephanalysis (schematized cloud chart) of clouds portrayed by two simultaneous NOAA-5 images covering parts of the North Atlantic, North Africa, the Mediterranean, and southern Europe early in 1977 is prepared. The use of infrared imagery to assist interpretation and analysis of cloud fields is often profitable. General relationships between clouds in the visible and infrared are summarized. The conventional nephanalysis key is reproduced and a flow diagram setting out the sequence of constructional stages which should always be followed is given. Author (ESA)

N80-14454# Bristol Univ. (England). Climatology and Remote Sensing.
CROP ENVIRONMENT MONITORING: THE ASSESSMENT OF ENVIRONMENTAL PHENOMENA USING SATELLITE REMOTE SENSING DATA
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 127-142 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The extension of agrometeorological statistics through the use of satellite data is examined. The environmental parameters or phenomena considered, ranked after the present utility and/or practicality of satellite remote sensing as an aid in their assessment, are: (1) rainfall, (2) temperature, (3) weather type and variability, and (4) cloud cover (radiation balance). For convenience, a differentiation is made between the atmospheric and pedologic environments of crops. In the first case the emphasis is on the utilization of weather satellite data for the extension of selected conventional meteorological statistics, the available in situ data are used as air or ground truth for the preparation, in effect, of meteorological trend surfaces upon which detail may be embroidered from satellite observations after these have been compared with, and calibrated by, the conventional data. In the second case there is a similar association of conventional and satellite soil intelligence, though in this case techniques to interdigitate the two have been less fully developed. Author (ESA)

N80-14455# Bristol Univ. (England). Climatology and Remote Sensing.
CROP MONITORING AND PREDICTION USING SATELLITE DATA
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 149-156 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

Analysis techniques used in making estimates of biomass (usually of natural or seminatural vegetation, especially in areas exploited for grazing) and in forecasting expected crop production (usually cultivated cereal crops) are studied. The use of LANDSAT spectral reflectance curves as prediction model inputs is emphasized. The use of statistical methods, agroclimatological methods, agrometeorological methods with crop prediction models is then considered. Results show clear advantages in the use of satellite data inputs for the monitoring of crops and in making harvest predictions. It is recommended that global schemes, based on these results, be initiated at least for certain crops in the near future in order to optimize agricultural resources. Author (ESA)

N80-14456# Bristol Univ. (England). Climatology and Remote Sensing.
SATELLITE REMOTE SENSING IN HAZARD MONITORING AND DISASTER EVALUATION
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 157-163 refs (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

The potential applicability of satellite remote sensing to short term disaster monitoring is discussed. Emphasis is on different types of agricultural disasters, such as drought, high-intensity short-period rainfall and subsequent flooding as well as hurricanes or monsoons. It is shown that remote sensing can also be of assistance in the assessment of the areas, and therefore, the volumes and values of the crops involved. Finally, the use of satellite data as a check against qualitative data from other sources, especially for countries with an inadequate conventional network for the observation and reporting of environmental conditions, is suggested. Author (ESA)

N80-14457# Bristol Univ. (England). Climatology and Remote Sensing.
SATELLITE REMOTE SENSING FOR AGRICULTURAL ADVISORIES AND PLANNING
E. C. Barrett *In* ESA Satellite Remote Sensing: Appl. in Agroclimatol. and Agrometeorol. 1979 p 164-165 (For primary document see N80-14440 05-43)
Avail: NTIS HC A09/MF A01

How an input of remote sensing data might be achieved to improve agroclimatological and related services in the various countries which stand to benefit from this technology is considered. Problems which commonly arise in the face of the implementation of new technologies are discussed. In spite of the individuals and organizations which would be interested in remote sensing data (farmers, farming communities, commercial firms, political organizations, humanitarian agencies), significant problems are foreseen in the widespread acceptance of remote sensing technology. Author (ESA)

N80-14458# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDY AND INVESTIGATION OF INFRARED MULTISPECTRAL TARGET CUEING TECHNIQUES Final Report, 22 Feb. - 6 Dec. 1978
Stephen R. Stewart and Jerry L. Beard 1979 156 p refs
(Contract DAAK70-77-C-0203)
(AD-A074799; ERIM-131500-9-F) Avail: NTIS HC A08/MF A01 CSCL 17/5

This report presents the results of a study to analyze and evaluate multispectral infrared target cueing algorithms using an infrared data base (in the 1 - 14 micrometers region) of tactical targets against real backgrounds. Using a modified M7 line scanner, simultaneous multispectral imagery of five bands in the 1 - 14 micrometers region were collected. A description of the collected infrared data base is given including discussions of the motivating factors in determining the spectral regions employed and target and background optical properties. Also, M7 system performance characteristics are examined. Finally, a preliminary evaluation of two different approaches to multispectral target cueing using the collected data base was accomplished. The results of both approaches, the first involving classical maximum likelihood classification using in-scene training and the second involving unsupervised spectral/spatial clustering followed by discrimination based upon size are reported. GRA

N80-14459# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
KALMAN FILTER PROCESSING OF POSITION AND DOPPLER RADAR MEASUREMENT IN COUPLED CARTESIAN COORDINATES
J. Buemmerstede Dec. 1978 84 p refs In GERMAN; ENGLISH summary
(Rept-274) Avail: NTIS HC A05/MF A01

An extended Kalman filter for processing three-dimensional RADAR data on fast maneuvering targets is presented. It takes into account the whole covariance matrix of measurement noise and includes the radial component of the velocity (Doppler) for the evaluation of the target state (position, velocity, and acceleration). The increase in calculation time induced by coupling the nine state components was restricted by systematic exploitation of the special structure of the algorithm such that the filter agrees with real time conditions. The filter is optimal in second order and allows for a considerably better estimation of state and separation of false echoes. The gain compared to simpler algorithms is shown. Author (ESA)

N80-14460# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
THREE DIMENSIONAL ADJUSTMENT OF THE 'WESTERN HARZ' TEST NETWORK [DREIDIMENSIONALE AUSGLEICHUNG DES TESTNETZES WESTHARZ]
Wolfgang Torge and Hans-Georg Wenzel 1978 60 p refs In GERMAN; ENGLISH summary Sponsored by Deut. Forschungsgemeinschaft
(Ser-B-234; ISBN-3-7696-8532-6) Avail: NTIS HC A04/MF A01

The adjustment of the geodetic test network 'Western Harz' is carried out in a local three-dimensional Cartesian coordinate system. To investigate the weight of the different observation types (distances, horizontal angles, astronomic azimuths, latitudes and longitudes, reciprocal vertical angles, ellipsoidal height differences by geometric astronomic levelling) and their contribution to the coordinates, several different pre-adjustments are computed. The accuracy of the adjusted (mainly determined by the distances and the ellipsoidal height differences) is on the order of + or - 2 to 3 cm for the local x, y, and z axis. Finally, the adjusted coordinates are transformed to ellipsoidal coordinates referring to the DHDN datum and to three-dimensional geocentric coordinates with the help of vertical deflections and the geoid undulation computed from gravity anomalies. Author (ESA)

N80-14461# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
CALCULATION OF THE AZIMUTH OF THE SECTION BETWEEN HOHENPEISSENBERG AND TROMSOE FROM SIMULTANEOUS DIRECTION MEASUREMENTS OF A SATELLITE IN ORDER TO IMPROVE ON THE ORIENTATION OF THE EUROPEAN TRIANGULATION NETWORK (RETRIG) [BERECHNUNG DES AZIMUTS HOHENPEISSENBERG-TROMSOE AUS SIMULTANEN RICHTUNGSMESSUNGEN NACH SATELLITEN ZUR VERBESSERUNG DER ORIENTIERUNG DES EUROPAEISCHEN TRIANGULATIONS- NETZES (RETrig)]
Klaus Kaniuth and Rudolf Zernecke 1978 37 p refs In GERMAN; ENGLISH summary
(Contract SFB-78)
(Ser-B-236; ISBN-3-7696-8534-2) Avail: NTIS HC A03/MF A01

A formula system is given for deriving the azimuth of the normal section between two observation stations from simultaneous direction measurements of satellite positions considering all mathematical correlations. These formulas are applied to the computation of the azimuth between the trigonometric points Hohenpeissenberg (Federal Republic of Germany) and Tromsoe (Norway) from 27 points of photographic observation of the satellite Pageos. The result has an r.m.s. error of + or - 0.28 sec and agrees well with other satellite solutions. On the other hand, the azimuth derived from the first solution of adjustment phase 2 of the European Triangulation Network differs by 0.9 sec from the satellite azimuths. Author (ESA)

N80-14462# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ON THE USE OF DIGITAL PHOTOGRAMMETRIC MEASUREMENTS IN THE COMPILATION OF TOPOGRAPHIC MAPS [BEITRAEGE ZUR DIGITALEN PHOTOGRAMMETRISCHEN MESSUNG FUER DIE HERSTELLUNG TOPOGRAPHISCHER KARTEN]
Hermann G. Neubauer 1978 125 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(Ser-1-Original-Rept-76) Avail: NTIS HC A06/MF A01

The preparation of topographic maps is discussed. The technique where topographic maps are first prepared in the form of graphic manuscripts by applying photogrammetric methods is briefly reviewed. It is shown that attempts at a rationalization of map production leads, with the aid of digital data, to automated procedures. The measurements, the computations by means of electronic data processing equipment, and the output of field comparison documents are discussed. Author (ESA)

N80-14463# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 1: INTRODUCTION AND GENERAL SOCIAL CONTROLS Final Report, 1975 - 1978
Irving L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Martha Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, Rodney K. Freed et al Mar. 1979 180 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299177/6; EPA-600/7-79-060A-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 08I

The technologies likely to be used for development of coal,

oil shale, uranium, oil, natural gas, and geothermal resources in eight western states (Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming) are described. The technological activities such as exploration, extraction, and conversion for developing the resource, and laws and regulations which affect the development of more than one of the six resources are considered. GRA

N80-14484# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 2: COAL Final Report, 1975 - 1978
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Martha Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, Rodney K. Freed et al Mar. 1979 395 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299178/4; EPA-600/7-79-060B-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 08I

The characteristics of coal resources in the western United States are described. A regional overview of number, size, and types of the coal mining operations conducted in Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming, is presented. Conversion technologies such as coal gasification, liquefaction, and electrical generation are discussed. R.C.T.

N80-14485# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 3: OIL SHALE Final Report, 1975 - 1978
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Martha Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, Rodney K. Freed et al Mar. 1979 328 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299179/2; EPA-600/7-79-060C-Vol-3) Avail: NTIS HC A15/MF A01 CSCL 08I

The development of oil shale resources in eight Western states (Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming) is discussed. The energy resource base, the technologies used to develop the resource, and the inputs and outputs for each technology development are summarized. The laws and regulations applying to the deployment and operation of each technology are examined. R.C.T.

N80-14486# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 4: URANIUM Final Report, 1975 - 1978
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Martha Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, and Rodney K. Freed Mar. 1979 255 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299180/0; EPA-600/7-79-060D-Vol-4) Avail: NTIS HC A12/MF A01 CSCL 08I

The technologies, inputs, outputs, laws and regulations associated with the development of uranium resources in eight western States (Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming) are described. The exploration, mining, and milling of uranium are discussed and technological alternatives which represent potential development options are sited. Input requirements such as manpower, materials and equipment, economics, water, land, and ancillary energy are reported. Residuals that may pose environmental hazards are surveyed. R.C.T.

N80-14487# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 5: OIL AND NATURAL GAS Final Report, 1975 - 1978
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Martha Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, and Rodney K. Freed Mar. 1979 231 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299181/8; EPA-600/7-79-060E-Vol-5) Avail: NTIS HC A11/MF A01 CSCL 08I

The quantity and location of crude oil are discussed. The development of crude oil from exploration to treatment of finished products and enhanced recovery techniques are described. The social controls for crude oil transportation are reported. R.C.T.

N80-14488# Oklahoma Univ., Norman. Science and Public Policy Program.
ENERGY FROM THE WEST: ENERGY RESOURCE DEVELOPMENT SYSTEMS REPORT. VOLUME 6: GEOTHERMAL Final Report, 1975 - 1978
Irvin L. White, Michael A. Chartock, R. Leon Leonard, Steven C. Ballard, Marth Gilliland, Timothy A. Hall, Edward J. Malecki, Edward B. Rappaport, Robert W. Rycroft, Rodney K. Freed et al Mar. 1979 221 p refs Prepared in cooperation with Radian Corp., Austin, Tex. 6 Vol.
(Contract EPA-68-01-1916)
(PB-299182/6; EPA-600/7-79-060F-Vol-6) Avail: NTIS HC A10/MF A01 CSCL 08I

The input requirements and outputs identified with the development and utilization of the geothermal resources of Arizona, Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming are summarized. The characteristics of geothermal resources are discussed in terms of geology, location, quantity, physical and chemical characteristics and ownership. R.C.T.

N80-14489# Texas Technological Univ., Lubbock. Water Resources Center.
GROUNDWATER RESOURCES OF THE TEXAS HIGH PLAINS: STATE-OF-THE-ART AND FUTURE RESEARCH NEEDS Final Report
Robert M. Sweazy, Lloyd V. Urban, C. C. Reeves, Jr., and George A. Whetstone Nov. 1978 139 p refs Sponsored by NSF
(PB-298147/0; NSF/RA-780571) Avail: NTIS HC A07/MF A01 CSCL 13B

A comprehensive review of the Texas High Plains area is presented highlighting the problems, solution, and research needs where groundwater is the primary source supply for agriculture. Quantity related research studies that require research to develop methods of enabling these arid and semi-arid areas to be agriculturally productive include hydraulic properties of aquifers, irrigation efficiency, cultivation and cropping practices, well modification, and water reuse and importation. Quality related studies to be addressed are irrigation efficiency, reuse, infiltration, nitrate pollution, sludge disposal, and microbiological investigations. Among the most pressing economic studies needed in the field of irrigated agriculture are those related to economic models, energy, and water values. GRA

N80-14470# Environmental Monitoring and Support Lab., Las Vegas, Nev.
SURFACE WATER QUALITY PARAMETERS FOR MONITORING OIL SHALE DEVELOPMENT Final Report
W. L. Kinney, A. N. Brecheisen, and V. W. Lambou Mar. 1979 157 p refs
(PB-297984/7; EPA-600/4-79-018) Avail: NTIS HC A08/MF A01 CSCL 13B

Listings of chemical, physical, and biological parameters which can be used to assess the environmental impact of oil shale development on surface water resources are given. Each of the potential water-related problems is addressed in the context of the probable cumulative regional impact of a maturing, commercial oil shale industry and in terms of local impact resulting from the prototype operation initially planned on leased public lands. The possible effects of potential pollutants on ambient water quality and the resulting impact on aquatic life, public water supplies, livestock, irrigation agriculture, and selected industries are evaluated. GRA

NSO-14471* New Mexico State Univ., Las Cruces.
DEEP TERRESTRIAL HEAT FLOW MEASUREMENTS IN NEW MEXICO AND NEIGHBORING GEOLOGIC AREAS Final Report, 1 Sep. 1976 - 30 Jun. 1978
Marshall Reiter Jun. 1979 85 p refs Prepared jointly with New Mexico Energy and Minerals Dept., Santa Fe and New Mexico Inst. of the Mining and Technology, Socorro
(Grant NSF GI-32482)
(PB-299489/5; NMEI-38) Avail: NTIS HC A05/MF A01 CSCL 08I

Experimental aspects of continuous temperature logging, vertical groundwater movement correction for heat flow, and terrestrial heat flow and crustal radioactivity in northeastern New Mexico and southern Colorado are described. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 85 Urban Technology and Transportation.*

NSO-14472* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SELF-RECONFIGURING SOLAR CELL SYSTEM Patent
Robert P. Gruber, inventor (to NASA) Issued 20 Nov. 1979 10 p filed 19 Jun. 1978 Supersedes N78-27520 (16 - 18, p 2408)
(NASA-Case-LEW-12586-1; US-Patent-4,175,249; US-Patent-Appl-SN-916655; US-Patent-Class-323-15; US-Patent-Class-307-63; US-Patent-Class-307-66; US-Patent-Class-323-19) Avail: US Patent and Trademark Office CSCL 10A

A self-reconfiguring solar cell array is disclosed wherein some of the cells are switched so that they can be either in series or in shunt within the array. This feature of series or parallel switching of cells allows the array to match the load to achieve maximum power transfer. Automatic control is used to determine the conditions for maximum power operation and to switch the array into the appropriate configuration necessary to transfer maximum power to the load.
Official Gazette of the U.S. Patent and Trademark Office

NSO-14473* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR CONCENTRATOR Patent
John G. Simpson, inventor (to NASA) Issued 6 Nov. 1979 6 p Filed 30 Nov. 1977 Supersedes N78-13556 (16 - 04, p 0499)
(NASA-Case-MFS-23727-1; US-Patent-4,173,397; US-Patent-Appl-SN-856465; US-Patent-Class-350-295; US-Patent-Class-126-438; US-Patent-Class-350-296; US-Patent-Class-126-442) Avail: US Patent and Trademark Office CSCL 10A

An improved solar concentrator is characterized by a number of elongated supporting members arranged in substantial horizontal parallelism with the axis and intersecting a common curve. A tensioned sheet of flexible reflective material is disposed in engaging relation with the supporting members in order to impart to the tensioned sheet a catenary configuration.
Official Gazette of the U.S. Patent and Trademark Office

NSO-14474* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD FOR FORMING A SOLAR ARRAY STRIP Patent
Robert I. Mueller (JPL) and Robert K. Yasui, inventors (to NASA) (JPL) Issued 13 Nov. 1979 7 p Filed 29 Mar. 1978 Supersedes N78-25560 (16 - 16, p 2138) Division of US Patent Appl. SN-809890, filed 24 Jun. 1977, US Patent-4,133,697 sponsored by NASA
(NASA-Case-NPO-13652-3; US-Patent-4,173,820; US-Patent-Appl-SN-891358; US-Patent-Class-29-572; US-Patent-Class-29-588; US-Patent-Class-29-627; US-Patent-Class-136-89P; US-Patent-Appl-SN-809890; US-Patent-4,133,697) Avail: US Patent and Trademark Office CSCL 10A

A flexible solar array strip is formed by a method which lends itself to automatic production techniques. Solder pads are deposited on printed circuitry deposited on a flexible structure. The resultant substrate is stored on a drum from which it is withdrawn and incrementally advanced along a linear path. Solderless solar cells are serially transported into engagement with the pads which are then heated in order to attach the cells to the circuitry. Excess flux is cleaned from the cells which are encapsulated in a protective coating. The resultant array is then spirally wound on a drum.
Official Gazette of the U.S. Patent and Trademark Office

NSO-14475 Oklahoma State Univ., Stillwater.
A PROBABILISTIC STUDY OF WIND-ELECTRIC CONVERSION SYSTEMS FROM THE POINT OF VIEW OF RELIABILITY AND CAPACITY CREDIT Ph.D. Thesis
Raghvendrarao Girirao Deshmukh 1979 167 p
Avail: Univ. Microfilms Order No. 7928197

Probabilistic models developed for wind energy conversion systems (WECS) are integrated with models of other power system components in order to evaluate the reliability of WECS assisted utility systems. A mathematical Weibull distribution function is used to model the actual wind speed distribution. It is shown that with a fixed wind regime and generation mix, an increase in the load demand causes only a slight increase in the risk index as long as the load value is less than or equal to the conventional generation capacity in the system. A load model based on the Markov chain with hourly peak load values is utilized in determining the load carrying capability of WECS assisted systems. The effect of including a transmission line is studied using two basic system configurations. It is shown that the interconnection of two WECS located in different wind regimes increases the availabilities of different capacities. Dissert. Abstr.

NSO-14476 Mississippi State Univ., State College.
VISUALIZATION OF NATURAL CONVECTION IN FLAT PLATE SOLAR COLLECTORS Ph.D. Thesis
Benjamin Okechukwu Okeke 1979 154 p
Avail: Univ. Microfilms Order No. 7927095

The effects of variations in gap spacing on the convective heat flow patterns between the collector surface and the glazing were determined. Visual and photographic observations were made through transparent plexiglas side walls, using tobacco smoke to make the flow patterns visible. Results indicate that the critical Rayleigh number was only marginally dependent on variations to the air gap width. A substantial increase in the critical Rayleigh number was observed as the horizontal temperature gradient was increased. The first sign of natural convection was seen to be a set of steady side-by-side transverse rolls increasing in size towards the higher temperature end of the test enclosure. Representative still photographs of the observed flow patterns are presented. Dissert. Abstr.

NSO-14477 Kentucky Univ., Lexington.
PHOTOVOLTAIC ENERGY CONVERSION IN POLYMER FILMS Ph.D. Thesis
Harin Shrinivas Ullal 1979 219 p
Avail: Univ. Microfilms Order No. 7927725

Photovoltaic energy conversion in poly-n-vinyl carbazole (PVK) and 2,4,7-trinitro-9-fluorenone (TNF) in the ratio (1:1) was investigated. It was determined that the maximum photovoltaic energy conversion efficiency is controlled by two critical parameters, namely the barrier height and the film thickness. The energy conversion efficiency was found to increase significantly by using low work function metal electrodes such as Sm. Conversely, by using high work function metal electrodes such as Pt, there is a marked decrease in the energy conversion efficiency. Also, there is a dramatic change in the energy conversion efficiency when there is a change in the film thickness. Model predictions and results of photoemission, dark current, and photocurrent studies are given. Dissert. Abstr.

N80-14478# PRC Energy Analysis Co., McLean, Va.
SATELLITE POWER SYSTEM (SPS): AN OVERVIEW OF PROSPECTIVE ORGANIZATIONAL STRUCTURES IN THE SOLAR SATELLITE FIELD
H. G. Edler Oct. 1978 19 p refs
(Contract EG-77-C-01-4024)
(TID-29094) HC A02/MF A01

A literature survey, interviews with acknowledged experts in the fields of organizational entities, space, solar energy, and the SPS concept, and an analysis of these inputs to identify the organizational alternatives and make judgments as to their feasibility to serve as patterns for a future SPS entity are presented. Selection and evaluation criteria were determined to include timeliness, reliability, and adequacy to contribute meaningfully to the U.S. supply; political feasibility (both national and international) and cost-effectiveness (including environmental and other external costs). Based on these criteria, four organizational alternatives are discussed which offer reasonable promise as potential options for SPS. These included three domestic alternatives and one international alternative. DOE

N80-14479*# National Aeronautics and Space Administration, Washington, D. C.
POWER FACTOR CONTROLLER
28 Feb. 1979 41 p Conf. held at Washington, D.C., 28 Feb. 1979 Tape Transcript
(NASA-TM-80755; P79-10188) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 10B

The power factor controller, and energy-saving device for electric motors, is presented. The commercialization of the device is discussed and its applications are described. R.E.S.

N80-14480*# Power Electronics Associates, Inc., Lincoln, Mass.
BI-DIRECTIONAL FOUR QUADRANT (BDQ4) POWER CONVERTER DEVELOPMENT Final Report
Francis C. Schwarz 20 Dec. 1979 249 p refs
(Contract NAS3-30363)
(NASA-CR-159660) Avail: NTIS HC A11/MF A01 CSCL 10B

The feasibility for implementation of a concept for direct ac/dc multikilowatt power conversion with bidirectional transfer of energy was investigated. A 10 kHz current carrier was derived directly from a common 60 Hz three phase power system. This carrier was modulated to remove the 360 Hz ripple, inherent in the three phase power supply and then demodulated and processed by a high frequency filter. The resulting dc power was then supplied to a load. The process was implemented without the use of low frequency transformers and filters. This power conversion processes was reversible and can operate in the four quadrants as viewed from any of the two of the converter's ports. Areas of application include: power systems on air and spacecraft; terrestrial traction; integration of solar and wind powered systems with utility networks; HVDC; asynchronous coupling of polyphase networks; heat treatment; industrial machine drives; and power supplies for any use including instrumentation. R.C.T.

N80-14481*# Burt, Hill, Kosar, Rittleman, and Associates, Butler, Pa.
RESIDENTIAL PHOTOVOLTAIC MODULE AND ARRAY REQUIREMENTS STUDY, APPENDICES Final Report
S. L. Nearhoof and J. R. Oster Jun. 1979 560 p Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-955149)
(NASA-CR-162529; DOE/JPL-955149-79/1-App) Avail: NTIS HC A24/MF A01 CSCL 10B

Regional building code variations, federal and city codes, and the national electric code are reviewed for their possible effects on the design of photovoltaic modules. Problems that photovoltaic arrays may impose on the insurability of residences are also discussed. Mounting configurations are developed for the modules, and grounding, wiring, terminal, and voltage requirements are established. Installation and materials costs are presented along with performance criteria. K.L.

N80-14482*# Burt, Hill, Kosar, Rittleman, and Associates, Butler, Pa.
RESIDENTIAL PHOTOVOLTAIC MODULE AND ARRAY REQUIREMENTS STUDY Final Report
S. L. Nearhoof and J. R. Oster Jun. 1979 64 p refs Prepared for JPL and DOE
(Contract JPL-955149)
(NASA-CR-162528; DOE/JPL-955149-79/1) Avail: NTIS HC A04/MF A01 CSCL 10B

Design requirements for photovoltaic modules and arrays used in residential applications were identified. Building codes and referenced standards were reviewed for their applicability to residential photovoltaic array installations. Four installation types were identified - integral (replaces roofing), direct (mounted on top of roofing), stand-off (mounted away from roofing), and rack (for flat or low slope roofs, or ground mounted). Installation costs were developed for these mounting types as a function of panel/module size. Studies were performed to identify optimum module shapes and sizes and operating voltage cost drivers. It is concluded that there are no perceived major obstacles to the use of photovoltaic modules in residential arrays. However, there is no applicable building code category for residential photovoltaic modules and arrays and additional work with standards writing organizations is needed to develop residential module and array requirements. K.L.

N80-14483*# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF AN ACCELERATED TEST DESIGN FOR PREDICTING THE SERVICE LIFE OF THE SOLAR ARRAY AT MEAD, NEBRASKA Final Report
G. B. Gaines, R. E. Thomas, G. T. Noel, T. S. Shilliday, V. E. Wood, and D. C. Carmichael 7 Jun. 1979 61 p refs Prepared for JPL and DOE
(Contract JPL-954328)
(NASA-CR-162534; DOE/JPL-954328-79/13) Avail: NTIS HC A04/MF A01 CSCL 10A

An accelerated life test is described which was developed to predict the life of the 25 kW photovoltaic array installed near Mead, Nebraska. A quantitative model for accelerating testing using multiple environmental stresses was used to develop the test design. The model accounts for the effects of thermal stress by a relation of the Arrhenius form. This relation was then corrected for the effects of nonthermal environmental stresses, such as relative humidity, atmospheric pollutants, and ultraviolet radiation. The correction factors for the nonthermal stresses included temperature-dependent exponents to account for the effects of interactions between thermal and nonthermal stresses on the rate of degradation of power output. The test conditions, measurements, and data analyses for the accelerated tests are presented. Constant-temperature, cyclic-temperature, and UV types of tests are specified, incorporating selected levels of relative humidity and chemical contamination and an imposed forward-bias current and static electric field. R.E.S.

N80-14484*# General Electric Co., Cincinnati, Ohio.
A CONCEPTUAL DESIGN STUDY ON THE APPLICATION OF LIQUID METAL HEAT TRANSFER TECHNOLOGY TO THE SOLAR THERMAL POWER PLANT Final Report
W. F. Zimmerman, C. S. Robertson, C. L. Ehde, S. M. Divakaruni, and L. E. Stacy 25 Sep. 1979 166 p refs Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-955018)
(NASA-CR-162544; DOE/JPL-1060/28; GEAEP-54) Avail: NTIS HC A08/MF 01 CSCL 10A

Alkali metal heat transfer technology was used in the development of conceptual designs for the transport and storage of sensible and latent heat thermal energy in distributed concentrator, solar Stirling power conversion systems at a power level of 15 kWe per unit. Both liquid metal pumped loop and heat pipe thermal transport were considered; system configurations included: (1) an integrated, focal mounted sodium heat pipe solar receiver (HPSR) with latent heat thermal energy storage; (2) a liquid sodium pumped loop with the latent heat storage, Stirling engine-generator, pump and valves located on the back side of the concentrator; and (3) similar pumped loops serving several concentrators with more centralized power conversion and storage. The focus mounted HPSR was most efficient, lightest and lowest in estimated cost. Design confirmation testing indicated satisfactory performance at all angles of inclination of the primary heat pipes to be used in the solar receiver. Author

N80-14485*# Coors Porcelain Co., Golden, Colo.
DEVELOPMENT OF MULLITE SUBSTRATES AND CONTAINERS Final Report, 7 Oct. 1977 - 15 Apr. 1979
J. D. Sibold 20 Apr. 1979 55 p Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-954878)
(NASA-CR-162543; DOE/JPL-954878-79/5) Avail: NTIS HC A04/MF A01 CSCL 10A

The mullite-molten silicon interaction was evaluated through fabrication of a series of bodies made with variations in density, alumina-silica ratio, and glass-crystalline ratio. The materials were tested in a sessile drop technique. None of the variations stood up to extended exposure to molten silicon sufficiently to be recommended as a container material. However, directional solidification experiments suggest that, under proper conditions, contamination of the silicon by mullite containers can be minimized. To improve an already good thermal expansion match between mullite and silicon, compositional variations were studied. Altering of the alumina-silica ratio was determined to give a continuously varying thermal expansion. A standard mullite composition was selected and substrates 40 x 4 x .040 inches were fabricated. Slotted substrates of various configurations and various compositions were also fabricated. R.E.S.

N80-14486*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES, AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Annual Report
P. B. Willis and B. Baum Jun. 1979 122 p Prepared for DOE and JPL
(Contracts NAS7-100; JPL-954527)
(NASA-CR-162542; DOE/JPL-954527-79/10) Avail: NTIS HC A06/MF A01 CSCL 10A

The reformulation of a commercial grade of ethylene/vinyl acetate copolymer for use as a pottant in solar cell module manufacture was investigated. Potentially successful formulations were prepared by compounding the raw polymer with antioxidants, ultraviolet absorbers and crosslinking agents to yield stabilized and curable compositions. The resulting elastomer was found to offer low cost (approximately $0.80/lb.), low temperature processability, high transparency (91% transmission), and low modulus. Cured specimens of the final formulation endured 4000 hours of fluorescent sunlamp radiation without change which indicates excellent stability. R.E.S.

N80-14487*# Purdue Univ., Lafayette, Ind.
ANALYSIS AND SIMULATION OF WIND ENERGY SYSTEMS Final Report
P. C. Krause Nov. 1979 60 p refs
(Grant NsG-3237)
(NASA-CR-162538) Avail: NTIS HC A04/MF A01 CSCL 10A

Using a wind fluctuation model, simulation results of the mechanical and electrical systems were obtained for the MOD-2 wind turbine generator system. The dynamic performance of the MOD-2 was studied during wind gusts of the 1-cos form from a constant wind velocity. If these are the type of wind fluctuations to which the wind systems will be subjected to, then the design of the MOD-2 appears adequate. There was one exception to this; with a rate limit incorporated in the pitch controller, an instability occurred during a 'down' gust which caused continuous, unbounded switching between the high and low modes. This is a control design problem which appears to be correctable. R.E.S.

N80-14488*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
APPLICATION OF FIELD-MODULATED GENERATOR SYSTEMS TO DISPERSED SOLAR THERMAL ELECTRIC GENERATION
R. Ramakumar 15 Aug. 1979 94 p refs Sponsored in part by DOE
(Contract NAS7-100; JPL Proj. 5102-136)
(NASA-CR-162536; JPL-Pub-79-83; DOE/JPL-1060-25) Avail: NTIS HC A05/MF A01 CSCL 10A

The state-of-the-art of field modulated generation system (FMGS) is presented, and the application of FMGS to dispersed solar thermal electric generation is discussed. The control and monitoring requirements for solar generation system are defined. A comparison is presented between the FMGS approach and other options and the technological development needs are discussed. R.E.S.

N80-14489*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ENVIRONMENTAL TESTING OF BLOCK 3 SOLAR CELL MODULES. PART 1: QUALIFICATION TESTING OF STANDARD PRODUCTION MODULES
John S. Griffith 1 Sep. 1979 21 p refs Sponsored in part by DOE
(Contract NAS7-100)
(NASA-CR-162547; JPL-Pub-79-96; DOE/JPL-1012-30) Avail: NTIS HC A02/MF A01 CSCL 10A

Qualification tests of solar cell modules are described. These modules continue to show improvement over earlier type modules tested. Cell cracking and delamination are less prevalent, and interconnect problems and electrical degradation from environmental testing are now rare. R.E.S.

N80-14490*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FRACTURE STRENGTH OF SILICON SOLAR CELLS
C. P. Chen 15 Oct. 1980 69 p refs
(Contracts NAS7-100; EX-76-A-29-1012; JPL Proj. 5101-137)
(NASA-CR-162540; DOE/JPL-1012-32; JPL-Pub-79-102)
Avail: NTIS HC A04/MF A01 CSCL 10A

A test program was developed to determine the nature and source of the flaw controlling the fracture of silicon solar cells and to provide information regarding the mechanical strength of cells. Significant changes in fracture strengths were found in seven selected in-process wafer-to-cell products from a manufacturer's production line. The fracture strength data were statistically analyzed and interpreted in light of the exterior flaw distribution of the samples. R.E.S.

N80-14491*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR THERMAL POWER SYSTEMS ADVANCED SOLAR THERMAL TECHNOLOGY PROJECT, ADVANCED SUBSYSTEMS DEVELOPMENT Semiannual Progress Report, 1 Oct. 1978 - 1 Apr. 1979
15 Aug. 1979 110 p Original contains color illustrations
(Contracts NAS7-100; DE-AI01-79ET-20307; JPL Proj. 5102-117)
(NASA-CR-162546; DOE/JPL-1060-20; JPL-Pub-79-107; SAPR-3) Avail: NTIS HC A06/MF A01 CSCL 10B

The preliminary design for a prototype small (20 kWe) solar thermal electric generating unit was completed, consisting of several subsystems. The concentrator and the receiver collect solar energy and a thermal buffer storage with a transport system is used to provide a partially smoothed heat input to the Stirling engine. A fossil-fuel combustor is included in the receiver designs to permit operation with partial or no solar insolation (hybrid). The engine converts the heat input into mechanical action that powers a generator. To obtain electric power on a large scale, multiple solar modules will be required to operate in parallel. The small solar electric power plant used as a baseline design will provide electricity at remote sites and small communities. Author

N80-14492*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SILICON MATERIALS OUTLOOK STUDY FOR 1980-1985 CALENDAR YEARS
E. Costogue, R. Ferber, W. Hasbach, R. Pellin, and C. Yaws 1 Nov. 1979 74 p refs Sponsored in part by DOE
(Contract NAS7-100; JPL Proj. 5230-1-Rev-A)
(NASA-CR-162541; JPL-Pub-79-110; DOE/JPL-1012-33)
Avail: NTIS HC A04/MF A01 CSCL 10A

The polycrystalline silicon industry was studied in relation to future market needs. Analysis of the data obtained indicates that there is a high probability of polycrystalline silicon shortage by the end of 1982 and a strong seller's market after 1981 which will foster price competition for available silicon. R.E.S.

N80-14493*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF THE DOE/NASA CRITICAL GAS TURBINE RESEARCH AND TECHNOLOGY PROJECT
John S. Clark 1980 21 p refs Proposed for presentation the 25th Annual Gas Turbine Conf., New Orleans, 9-13 Mar. 1980; sponsored by the Am. Soc. of Mech. Engineers
(Contract EF-77-A-01-2593)
(NASA-TM-79307; DOE/NASA/2593-79/11; E-263) Avail: NTIS HC A02/MF A01 CSCL 10B

Activities performed in order to provide an R&T data base for utility gas turbine systems burning coal-derived fuels are described. Experiments were run to determine the corrosivity effects of trace metal contaminants (and potential fuel additives) on gas turbine materials and these results were correlated in a corrosion-life prediction model. Actual fuels were burned in a burner rig hot corrosion test to verify the model. A deposition prediction model was assembled and compared with results of actual coal-derived fuel deposition tests. Thermal barrier coatings were tested to determine their potential for protecting gas turbine hardware from the corrosive contaminants. Several coatings were identified with significantly improved spallation-resistance (and, hence, corrosion resistance). A.R.H.

N80-14494# Rensselaer Polytechnic Inst., Troy, N. Y. Center for Architectual Research.
BARRIERS TO THE APPLICATION OF WIND ENERGY CONVERSION SYSTEMS IN URBAN SETTINGS
Robert E. Duffy, Walter M. Kroner, ed., Michael Kwartler, and George W. Uiseth Dec. 1979 176 p refs Sponsored by New York State Energy Res. and Develop. Authority
Avail: NTIS HC A09/MF A01

The issues which arise through such activities as the planning/building regulatory process, location selection, mounting or installation, and operation and maintenance of wind energy conversion systems (WECS) were identified and analyzed in relation to their legal environmental, technical, institutional, economic, safety, and social impacts. Case studies and simulation were performed, and potential differences in barriers described in national publications were compared with conditions unique to the northeast region and/or to New York State. Those urban areas in New York State where sufficient wind power is available for WECS consideration were identified, and the legal instruments and jurisdictional constraints relevant to them were analyzed. A.R.H.

N80-14495*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT AND TESTING OF THE JUNKEEPER CONTROL CORPORATION INTEGRATED PROGRAMMABLE ELECTRONIC CONTROLLER AND HYDRONICS PACKAGE Final Report
James D. Hankins Aug. 1979 21 p refs
(NASA-TM-78244) Avail: NTIS HC A02/MF A01 CSCL 10A

Additional developmental work on the existing programmable electronic controller and hydronic package for use with solar heating and cooling systems is summarized. The controller/hydronics subsystems passed all acceptance tests and performance criteria. The subsystems were shown marketable for public use. R.E.S.

N80-14496*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT AND TESTING OF THE RHO SIGMA INCORPORATED MICROPROCESSOR CONTROL SUBSYSTEM Final Report
James D. Hankins Oct. 1979 23 p refs Sponsored in part by DOE
(Contract NAS8-32256)
(NASA-TM-78246) Avail: NTIS HC A02/MF A01 CSCL 10A

Product development and performance tests of three programmable microprocessor controllers for use with solar heating and cooling systems are presented. The products were developed to be marketable for public use. R.E.S.

N80-14497*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
THERMAL PERFORMANCE EVALUATION OF THE SUNCATCHER SH-11 (LIQUID) SOLAR COLLECTOR
Jul. 1980 22 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161253) Avail: NTIS HC A02/MF A01 CSCL 10A

The procedures used and the results obtained during the evaluation test program on the Solar Unlimited, Inc., Suncatcher SH-11 (liquid) solar collector are presented. The flat-plate collector case assembly is made of .08 inch aluminum 3003 H14 riveted with fiberglass board insulation. The absorber consists of collared aluminum fins mechanically bonded to 3/8 inch copper tubing and coated with 3M Nextel black. Water is used as the working fluid. The glazing is made of a single glass, 1/8 inch water white, tempered and antireflective. The collector weight is 85 pounds with overall external dimensions of about 35.4 in x 82.0 in x 4.0 in. Thermal performance data on the Solar Unlimited Suncatcher SH-11 solar collector under simulated conditions were conducted using the MSFC Solar Simulator. M.M.M.

N80-14498*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT AND TESTING OF THE SOLAR CONTROL CORPORATION MODULAR CONTROLLER AND SOLARSTAT SUBSYSTEM Final Report
James D. Hankins Aug. 1979 15 p refs Prepared for DOE Prepared by Solar Control Corp., Boulder, Colo.
(Contract NAS8-32258)
(NASA-TM-78243) Avail: NTIS HC A02/MF A01 CSCL 10A

Results of development work on an existing controller and solarstat subsystem for use with solar heating and cooling systems are presented. The deliverable end items, program objectives, and how they were accomplished are described. It is shown that the products developed are marketable and suitable for public use. J.M.S.

N80-14499*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT, TESTING AND CERTIFICATION OF THE SIGMA RESEARCH, MAXI-THERM-S-101 THERMOSYPHON HEAT EXCHANGER Final Report
James D. Hankins Oct. 1979 19 p refs
(NASA-TM-78245) Avail: NTIS HC A02/MF A01 CSCL 10A

A thermosyphon liquid-to-air heat exchanger developed for use in heating systems in residential single family dwellings and small commercial applications is described. The cabinet design, rationale for the horizontal positioning of the exchanger, and design of the shut-off valve are discussed. The performance of the heating module is given in tabular form. J.M.S.

N80-14500*# Wyle Labs., Inc., Huntsville, Ala.
RESULTS OF THERMAL PERFORMANCE EVALUATION OF THE OWENS-ILLINOIS SUNPACK LIQUID SOLAR COLLECTOR AT INDOOR CONDITIONS
10 Oct. 1979 28 p refs Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161189) Avail: NTIS HC A03/MF A01 CSCL 10A

Test procedures and results of the thermal performance of a liquid, evacuated tube, solar collector under simulated conditions are presented. The collector tested was a module used on the early demonstration projects. R.E.S.

N80-14501*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMPUTER PROGRAM FOR ASSESSING THE ECONOMIC FEASIBILITY OF SOLAR ENERGY FOR SINGLE FAMILY RESIDENCES AND LIGHT COMMERCIAL APPLICATIONS
J. Alan Forney (Systems Analysis and Integration Lab.), David Walker (Computer Sciences Corp., Huntsville, Ala.), and Mike Lanier (Computer Sciences Corp., Huntsville, Ala.) Sep. 1979 147 p
(NASA-TM-78251) Avail: NTIS HC A07/MF A01 CSCL 10B

Computer program, SHCOST, was used to perform economic analyses of operational test sites. The program allows consideration of the economic parameters which are important to the solar system user. A life cycle cost and cash flow comparison is made between a solar heating system and a conventional system. The program assists in sizing the solar heating system. A sensitivity study and plot capability allow the user to select the most cost effective system configuration. M.G.

N80-14502# Boston Univ., Mass. Dept. of Chemistry.
PHOTOSENSITIZATION MECHANISMS FOR ENERGY STORING ISOMERIZATIONS Technical Report, 1 Nov. 1976 - 28 Feb. 1979
Guilford Jones, II, Phan Thanh Xuan, and Sheau Hwa Chiang 1 Jul. 1979 32 p refs
(Contract N00014-76-C-0442)
(AD-A074968; TR-9) Avail: NTIS HC A03/MF A01 CSCL 07/4

The results of a study of photochemical storage of radiant energy in organic molecules are reviewed and prospects for the reversible storage of solar energy outlined. A number of intramolecular cycloaddition reactions are identified as candidates for efficient photochemical energy storage and findings concerning the mechanisms of these reactions are discussed. Strategies for the photosensitization of reactions to visible light are evaluated. The use of wavelengths past 500 nm is demonstrated for an energy storing isomerization which is efficiently driven by a triplet energy transfer mechanism. GRA

N80-14503# Boston Univ., Mass. Dept. of Chemistry.
ENERGY STORING ORGANIC PHOTOREACTIONS Final Report, 1 Nov. 1975 - 28 Feb. 1979
G. Jones, II 1 Aug. 1979 11 p refs
(Contract N00014-76-C-0442)
(AD-A074915) Avail: NTIS HC A02/MF A01 CSCL 10/3

Results of a study of energy storing organic photoreactions are summarized. Discussion includes criteria for efficient photon energy storage, quantum yield and other quantitative results for a variety of photoisomerization and photoaddition reactions, the nature of intermediates for these photoreactions, photochemistry of charge-transfer complexes, and prospects for photochemical storage of solar energy. GRA

N80-14504# Dayton Univ., Ohio. School of Engineering.
ANALYSIS OF REMOTE SITE ENERGY STORAGE AND GENERATION SYSTEMS Final Technical Report, Jul. 1978 - Jun. 1979
J. N. Crisp, W. S. Bishop, J. D. Pinson, and L. A. Anderson Jul. 1979 148 p refs
(Contract F33615-77-C-2004)
(AD-A074869; UDR-TR-79-35; UDSE-TR-79-02; AFESC/ESL-TR-79-20) Avail: NTIS HC A07/MF A01 CSCL 10/2

This report presents the results of an investigation and analysis of energy storage systems and alternate energy sources for remote site applications. The first phase of the effort centered on the broad based study of hydrogen storage, thermal storage, batteries, and flywheels as energy storage systems along with wind turbine, solar photovoltaic, and solar thermionic energy converters. A wind turbine battery system was recommended based on performance, cost and availability. Effort under the second phase of the program concentrated on a system using two separate nominal eight kilowatt wind turbine modules in conjunction with a lead-acid battery energy storage unit. The system was specified to operate in conjunction with an existing power grid system located at Bar Main, Barter Island, Alaska. Specific system concepts and recommendations are presented with supporting analyses. A design checklist is included with specific items for consideration in the preparation of a design specification. GRA

N80-14505# GTE Sylvania, Inc., Needham Heights, Mass. Communications Systems Div.
LITHIUM INORGANIC ELECTROLYTE BATTERY DEVELOPMENT Interim Report, Jun. 1977 - Oct. 1978
F. Goebel Apr. 1979 60 p refs
(Contract F33615-77-C-2021; AF Proj. 3145)
(AD-A073858; AFAPL-TR-79-2026) Avail: NTIS HC A04/MF A01 CSCL 10/3

This report presents the results of the first half of a three year program to conduct exploratory development to improve the safety/performance characteristics of lithium anode/inorganic electrolyte batteries. Development has been conducted in 3 major areas: capacity retention of cylindrical cells, low temperature capability of cylindrical cells, and abuse tests of cylindrical and prismatic cells. Significant accomplishments include providing capacity down to the 3.0 volt level cutoff at -40 degrees and no venting or explosion of cells during abuse tests, except during incineration when it is expected. GRA

N80-14506# Eagle-Picher Industries, Inc., Joplin, Mo. Couples Dept.
IMPROVED THERMAL BATTERY PERFORMANCE Final Report, Jun. 1976 - Feb. 1979
James A. DeGruson Jun. 1979 79 p refs
(Contract F33615-76-C-2074; AF Proj. 3145)
(AD-A073856; AFAPL-TR-79-2042) Avail: NTIS HC A05/MF A01 CSCL 10/3

During the course of this program, Eagle-Picher Industries, Inc. has developed a thermal battery which has demonstrated an energy density in excess of 17 watt-hours per pound. This advancement of approximately three times the energy density of thermal batteries was accomplished with the lithium aluminum iron disulfide system. The technology necessary to manufacture a thermal battery which will produce 28 volts at 30 amperes for 30 minutes has been achieved. GRA

N80-14507# Coast Guard Research and Development Center, Groton, Conn.
EVALUATION OF SOLAR PHOTOVOLTAIC ARRAYS FOR USE ON MARINE AIDS TO NAVIGATION Final Report, May 1974 - Jul. 1978
R. K. Kostuk 30 Mar. 1979 32 p refs
(AD-A074893; CGR/DC-7/79; USCG-D-43-79) Avail: NTIS HC A03/MF A01 CSCL 10/2

During the period from May 1974 to July 1978, four test and evaluation programs of solar photovoltaic arrays were conducted to evaluate the potential of these energy sources for use on marine aids to navigation. Array testing consisted of: long-term rooftop exposure; field deployment on buoys in Alaska, Florida, and Massachusetts; field deployment on buoys in Long Island Sound; and initial development of a screening test to evaluate performance in a short time frame. The results of these tests are presented. GRA

N80-14508# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR HYDROTHERMAL ELECTRIC AND DIRECT HEAT APPLICATION
R. A. Black, J. V. Dionne, L. Falick, and E. B. Harvey [1979] 98 p
(TID-2884-Draft) Avail: NTIS HC A05/MF A01

The use of vapor dominated hydrothermal resources for production of electric power is discussed. The ability to handle high temperature, low to moderate-salinity geofluids and convert the heat to usable power using existing technology is reviewed. The use of high temperature, high salinity brines, and moderate temperature resources is examined for economic operation. Technical risks and environmental acceptability are discussed along with technical, market/economic, environmental, institutional readiness, and benefit analysis. A commercialization plan for hydrothermal electric and direct heat applications is presented. DOE

N80-14509# Oak Ridge National Lab., Tenn.
OUTLOOK FOR NUCLEAR FISSION ENERGY
T. D. Anderson 1978 14 p refs Presented at 2d Ann. Intern. Conf. on Energy, Washington, D.C.
(Contract W-7405-eng-26)
(CONF-7811126-1) Avail: NTIS HC A02/MF A01

The status of nuclear power as an energy source is discussed. The development of light water breeder reactors for electric power generation is examined. Present nuclear energy research and development are reported. The electric utility industry's commitment to nuclear power and the effects of the energy crisis on the nuclear power inudstry are examined. A.W.H.

N80-14510# Little (Arthur D.), Inc., Cambridge, Mass.
ENERGY ANALYSIS OF THE BASIC MATERIALS UTILIZED IN ELECTRIC POWER TRANSMISSION SYSTEMS
30 Apr. 1979 353 p
(Contract EC-77-C-01-5043)
(HCP/T5043-01) Avail: NTIS HC A16/MF A01

The energy content per mile of installed underground and overhead power transmission systems was calculated for the following types of systems: self contained oil filled cables; HPOF pipe type cables; extruded dielectric cables; compressed gas insulated systems; overhead lines (ac and dc); and two proposed superconducting systems (ac and dc). The system operating voltages analyzed included 138, 230, 345, 500, 765 and 1,200 kV for ac systems. Systems were not analyzed at the higher voltages. Installation energy requirements, generally 10% or less of the inherent system energy content based on the materials used in each system, are discussed. The energy content of 36 materials and basic products, in terms of Btu per ton, was calculated. Substitution of conductor materials (e.g., aluminum for copper) in cable systems are examined in relation to total system energy content. DOE

N80-14511# Tennessee Univ., Knoxville. Dept. of Civil Engineering.
SIMULATION APPROACH FOR BASE-LINE ENERGY-SITING ANALYSIS
R. L. Church and E. L. Hillsman (Oak Ridge Natl. Lab., Tenn.) 1979 16 p refs Presented at Instrument Soc. of Am., Pittsburgh Modeling and Simulation Conf., Pittsburgh, 25 Apr. 1979
(Contract W-7405-eng-26)
(CONF-790459-22) Avail: NTIS HC A02/MF A01

A simulation model for predicting regional energy-siting patterns is discussed. The model results are used to project regional environmental and economic impacts for DOE. Emphasis is placed on modifications, which include casting the siting decision within a multiobjective framework and including intermediate optimizing capabilities to meet water resource and other constraints. DOE

N80-14512# Brookhaven National Lab., Upton, N. Y.
HIGHLIGHTS OF THE ENERGY TECHNOLOGY PROGRAMS Annual Report
Dec. 1978 49 p
(Contract EY-76-C-02-0016)
(BNL-50959) Avail: NTIS HC A03/MF A01

Activities in: electrolysis based hydrogen energy storage systems; an electrochemically regenerative hydrogen-halogen energy storage system; fuel cells (materials and electrolysis); high temperature water electrolysis; and hydrogen energy storage systems for automobile propulsion are summarized. Energy programs reported on include: solar assisted heat pump systems; solar cooling subsystems and systems; solar demonstration projects; hardware simulators for tests of solar cooling/heating systems; fossil energy programs; catalytic process for conversion of synthesis gas to methanol; coal fired heater; coal/oil mixture combustion; rotating fluidized bed containing limestone for removal of sulfur from hot gases; improved oil and gas burners; and residue and waste fuels. DOE

N80-14513# Sandia Labs., Albuquerque, N. Mex.
Li/FeS2 SYSTEM FOR THERMAL BATTERIES
D. M. Bush Jun. 1979 29 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0470) Avail: NTIS HC A03/MF A01

Lithium alloys were substituted for the Mg anodes in both platen-heated single cells and pyrotechnically activated batteries and gave 0.5 V or 33% more voltage per cell than Mg. Both Li-Al(20 w/o Li) and Li-Si(40 to 53 w/o Li) alloys were evaluated. During single-cell tests, Li-Al performed as well as Mg and Li-Si gave longer life for the same weight anode. Ten and 16 cell batteries were tested. Best results were obtained with the Li-Si anodes; a 16 cell battery discharged at 50 mA/sq cm had a life of 63 min to 24.0 V in a 12.7 cm diam can, and 59 min in a 11.4 cm can. While the cell voltage was somewhat lower, the ability of the Li-Si/FeS2 battery to operate for an hour at the higher current density resulted in twice the volumetric specific energy when compared to a Ca/CaCrO4 battery which had been discharged at 15 mA/sq cm. DOE

N80-14514# Brookhaven National Lab., Upton, N. Y. National Center for Analysis of Energy Systems.
DYNAMIC ENERGY SYSTEM OPTIMIZATION MODEL
E. A. Cherniavsky, L. L. Juang, and H. Ablock May 1979 119 p
(Contract EY-76-C-02-0016)
(EPRI-EA-1078) Avail: NTIS HC A06/MF A01

The dynamic energy system optimization model (DESOM) developed to investigate the roles of different technologies in the energy system over an extended period of time is discussed. Means to improve computational features of the program, to incorporate electric sector detail into the existing version of DESOM, and to transfer the DESOM model to EPRI are examined. DOE

N80-14515# Department of Energy, Washington, D. C. Office of State and Local Governments.
REPORT TO THE CONGRESS ON THE COORDINATION OF FEDERAL ENERGY CONSERVATION PROGRAMS INVOLVING STATE AND LOCAL GOVERNMENTS
May 1979 117 p
(DOE/TIC-10127) Avail: NTIS HC A06/MF A01

Four laws which authorize the government to develop and implement specific energy conservation programs are discussed. The development, implementation, and administration of the energy programs are examined and the coordination activities between Federal, State, and Local governments on the energy programs are analyzed. A.W.H.

N80-14516# Illinois Univ., Urbana. Center for Advanced Computation.
NEW HYBRID 1971 ENERGY INTENSITIES, PART 1 Final Report
P. S. Penner, R. A. Herendeen, and T. Milke Dec. 1978 9 p refs
(Contract EM-78-S-02-4628)
(COO-4628-4-Pt-1) Avail: NTIS HC A02/MF A01

A set of hybrid energy intensities from 1971 direct energy use data and 1967 economic input/output information are computed and discussed. Energy intensities represent the total energy used through the economy to produce one unit of output from each of the 90 sectors defined as spanning the U.S. economy in 1967. The data base discussed contains, among other items, data on the consumption of over 100 fuel types by 154 consuming sectors in the U.S. economy. DOE

N80-14517# California Univ., Livermore. Lawrence Livermore Lab.
US ENERGY FLOW IN 1978
W. J. Ramsey 11 Jun. 1979 6 p
(Contract W-7405-eng-48)
Avail: NTIS HC A02/MF A01

An energy flow diagram for the U.S. for 1978 is presented. Some significant differences between 1977 and 1978 are: total energy use increased 1.8%; oil imports decreased to 17.4 quads, more than 7% below 1977; coal and natural gas remained about constant; the industrial sector remains unique in that its energy use decreased somewhat due to conservation efforts; delivered nuclear power increased by 8%, supplying one-eighth of all electricity; and a trend toward electrification continued with distributed electrical energy increasing by 3.9%. DOE

N80-14518# Midwest Research Inst., Golden, Colo.
APPLICATION OF DIFFUSION RESEARCH TO SOLAR ENERGY POLICY ISSUES
J. D. Roessner Mar. 1979 35 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-51-194) Avail: NTIS HC A03/MF A01

Two types of information requirements that appear to be basic to DOE solar energy policy decisions are examined: (1) how can the future market success of solar energy technologies be estimated, and (2) what factors influence the adoption of solar energy technologies, and what specific programs could promote solar energy adoption most effectively? The ability of a body of research, referred to here as diffusion research, to supply information that could partially satisfy these requirements is assessed. The strengths and limitations of current knowledge about the diffusion of innovations are summarized, the applicability

of both existing knowledge and the diffusion approach to the identified solar energy policy issues are discussed, and ways are suggested in which diffusion approaches can be modified and existing knowledge employed to meet short and long term goals of DOE. DOE

N80-14519# Midwest Research Inst., Golden, Colo.
IMPLEMENTATION OF STATE SOLAR INCENTIVES: LAND-USE PLANNING TO ENSURE SOLAR ACCESS
P. Pollock Mar. 1979 41 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-51-163) Avail: NTIS HC A03/MF A01

State incentives in land use planning to ensure solar access are examined to determine issues in program design and implementation. These incentives include broad legislative grants of solar rights, application of nuisance law to solar collector shading, removal of restrictive covenants or establishment of covenants to protect solar access, provision for privately negotiated solar easements, and land use planning and regulation to include passive solar design and provision for active solar collection in land use development. Oregon is engaged in a statewide, mandated local comprehensive planning process which includes consideration of energy conservation and renewable energy sources. California has two solar access related bills which address private solar easements, subdivision design, restrictive covenants, and shading by vegetation. New Mexico has a broad legislative grant of solar rights based on water rights law. Minnesota authorized the inclusion of solar energy as a factor in local land use planning and established a private easement procedure.DOE

N80-14520# Midwest Research Inst., Golden, Colo.
IMPLEMENTATION OF STATE SOLAR INCENTIVES: A PRELIMINARY ASSESSMENT
J. Ashworth, B. Green, P. Pollock, R. Odland, R. Saltonstall, and L. J. Perelman Jan. 1979 238 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-51-159) Avail: NTIS HC A11/MF A01

The implementation of official state solar energy incentives programs was investigated. Questions of incentive design and program effectiveness are addressed in certain portions of the text, but the bulk of the research effort is directed toward examining how laws and legislative mandates have been transformed into rules, regulations, eligibility criteria, standards, comprehensive land use plans, grants, tax deductions, and demonstration projects. Most of the programs discussed will be official governmental actions, although the roles of private groups, advisory councils, and universities are addressed. Programs were examined in Arizona, California, Florida, Maine, Massachusetts, Minnesota, Montana, New Mexico, and Oregon. DOE

N80-14521# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR ENERGY FROM URBAN WASTES
D. Walter, S. Levy, and C. Rines [1979] 48 p
(TID-28852-Draft) Avail: NTIS HC A03/MF A01

Three broad technologies are potentially available to recover energy and energy-intensive materials from urban wastes: mechanical, thermal, and biological. Worldwide experience indicates that commercialization is feasible although there are a number of technical, economic, and institutional barriers that currently limit the use of wastes. From a technical standpoint the daily variability of urban waste makes control and optimization of any process difficult. Further development and optimization of equipment is necessary to improve efficiency and reduce capital costs although there are no foreseen technological barriers and basic breakthroughs are not needed. Technical, market/economic, environmental, and insitutional readiness and benefits analysis are discussed. The commercializations strategy is summarized. DOE

N80-14522# Brookhaven National Lab., Upton, N. Y. Energy and Environment Dept.
SOLID ELECTROLYTE FUEL CELL FOR ELECTRIC POWER GENERATION
S. Srinivasan and H. S. Isaacs 1979 10 p refs Presented at the 14th Intersoc. Energy Conversion Conf., Boston, 5-10 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26238; CONF-790803-29) Avail: NTIS HC A02/MF A01

The development of high temperature fuel cells with molten carbonates or solid electrolytes are described. The advantages of solid electrolyte over the molten electrolyte fuel cells including: higher projected efficiencies; higher attainable current densities; and no cell corrosion problems are discussed. The design, fabrication, and testing of multicell stacks (5 cells) are discussed. The operating cell characteristics are examined in respect to meeting power plant performance goals. A.W.H.

N80-14523# Institute of Gas Technology, Chicago, Ill.
FUEL CELL OPTION
K. F. Blurton Oct. 1978 13 p Presented at Conf. on Nat. Energy Econ. 2, Tulsa, Okla., 18-20 Sep. 1978
(Contract EM-78-C-03-1735)
(CONF-7809137-1) Avail: NTIS HC A02/MF A01

Fuel cell technology and its potential application is discussed. The strategy of fuel cell development is examined and the attributes of fuel cell power plants are described. DOE

N80-14524# Illinois Univ., Urbana. Center for Advanced Computation.
ENERGY CONSERVATION IN THE US ECONOMY FROM INCREASED RECYCLE OF OBSOLETE STEEL SCRAP Final Report
J. R. Brodrick Nov. 1978 110 p refs
(Contract EY-76-S-02-2893)
(COO-2893-10) Avail: NTIS HC A06/MF A01

Energy consumption in the steel industry is discussed and a recycling method is proposed for energy conservation. A model is presented to define the energy savings for the steel industry, the labor impact, and the economic factors of recycling scrap metal. A.W.H.

N80-14525# Argonne National Lab., Ill.
DEFINITION AND ANALYSIS OF THE BARRIERS TO THE IMPLEMENTATION OF URBAN ENERGY RECOVERY SYSTEMS
May 1979 22 p
(Contract W-31-109-eng-38)
(ANL/CNSV/TM-2) Avail: NTIS HC A02/MF A01

Major barriers to the implementation of urban energy recovery systems and the identification of Federal programs believed to be the most effective in developing these systems are presented. A survey of 40 persons experienced in the implementation of urban energy recovery systems, which provides the results, is analyzed. DOE

N80-14526# Los Alamos Scientific Lab., N. Mex.
APPLICATIONS OF FUEL CELLS IN TRANSPORTATION
B. McCormick, R. Bobbett, D. Lynn, S. Nelson (DOE, Washington, D.C.), S. Srinivasan (Brookhaven National Lab.), and J. McBreen (Brookhaven National Lab.) 1979 11 p Presented at the 14th Intersoc. Energy Conversion Conf., Boston, 5-10 Aug. 1979
(Contract W-7405-eng-36)
(LA-UR-79-628; CONF-790803-16) Avail: NTIS HC A02/MF A01

A detailed technical and economic evaluation of potential applications for fuel cells in transportation is given. Four vehicle types were evaluated: city bus, highway bus, delivery van, and consumer car, using fuel cell and reformer data. Various fuel options and performance vs economic tradeoffs were considered and final recommendations are presented. DOE

N80-14527# Sandia Labs., Albuquerque, N. Mex.
THERMAL AGING CHARACTERISTICS OF ELECTRODEPOSITED BLACK CHROME SOLAR COATINGS
R. B. Pettit and R. R. Sowell 1979 5 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0789)
(SAND-78-2094C; CONF-790541-32) Avail: NTIS HC A02/MF A01

By reducing the trivalent chromium concentration of Chromonyx black chrome plating bath, coatings with improved thermal stability characteristics were obtained. For trivalent chromium concentrations as low as 8 g/l, solar absorptance

values decreased only a few percent from initial values of approximately 0.97 after heating in air at 400 C for over 3600 hours. Coating composition and structure were studied using transmission electron microscopy, scanning electron microscopy, and sputter Auger-profiling. Initial results indicate that the coatings from the nominal bath composition are composed of small particles, with diameters in the range 65 to 90 nm. When the trivalent chromium concentration is reduced, these particles agglomerate into larger clusters that are 150 to 250 nm in size. Upon heating in air, all coatings experience a substantial amount of oxidation, but the stable coatings maintain a significantly higher metallic chromium content. DOE

N80-14528# California Univ., Livermore. Lawrence Livermore Lab.
NON-TRACKING INFLATED CYLINDRICAL SOLAR CONCENTRATOR
J. W. Gerich 22 May 1979 18 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract W-7405-eng-48)
(UCRL-82721; CONF-790541-12) Avail: NTIS HC A02/MF A01

A concentrating solar collector able to produce pressurized hot water up to a temperature of 175 C was developed. The collector structure consists mainly of an inflated thin film plastic cylinder that is clear on the upper portion and is an aluminized reflector on the lower portion. The reflector concentrates sunlight on a receiver tube which is jacketed with a heat transfer suppressing, thin film plastic cylinder. The first experimental collectors verified performance modeling codes. The second generation collectors now being constructed address cost considerations and ease of fabrication, installation, and maintenance. It was found that the installed cost of the inflated concentrator is likely to be one-fifth that of parabolic trough concentrators. An experimental apparatus was developed to measure the total hemispherical emittance of full size receiver tubes. Test results indicate a rather dramatic increase in the room temperature value at typical concentrator operating temperatures. R.E.S.

N80-14529# California Univ., Livermore. Lawrence Livermore Lab.
LAWRENCE LIVERMORE LABORATORY GEOTHERMAL ENERGY PROGRAM: A STATUS REPORT ON THE DEVELOPMENT OF THE TOTAL-FLOW CONCEPT M.S. Thesis
A. L. Austin and A. W. Lundberg 2 Oct. 1978 77 p refs
(Contract W-7405-eng-48)
(UCRL-50046-77) Avail: NTIS HC A05/MF A01

The technology development activities of the Geothermal Energy Program at the Lawrence Livermore Laboratory are summarized. Significant progress toward development of the total-flow concept was made. The results show that the original goal of 70% engine efficiency for the total-flow impulse turbine is achievable; that a total-flow system is competitive economically with conventional systems; and that the total-flow concept offers the benefit of more efficient utilization of geothermal resources for electric power production. The evaluation of several liquid expanders designed for low-temperature (including geopressured) resources suggests that if development were continued, these expanders could be used in combination with conventional systems to increase overall system efficiency. DOE

N80-14530# Argonne National Lab., Ill.
LITHIUM/METAL SULFIDE BATTERY DEVELOPMENT
R. K. Steunenberg 1979 15 p refs Presented at Fast Ion Transport in Solids-Electrode and Electrolytes Conf., Lake Geneva, Wis., 21 May 1979
(Contract W-31-109-eng-38)
(CONF-790538-10) Avail: NTIS HC A02/MF A01

Lithium/metal sulfide batteries developed for electric vehicle propulsion and for stationary energy storage applications such as load leveling are described. The battery cells consist of lithium-aluminum or lithium-silicon negative electrodes, iron sulfide (FeS or FeS2) positive electrodes, and molten LiCl-KCl electrolyte. The cells are enclosed in a thermally insulated jacket to maintain an operating temperature of 400 to 500 C. A 40 kWh electric vehicle battery consisting of 120 Li-Al/FeS cells is described. DOE

N80-14531# Argonne National Lab., Ill.
ADVANCED BATTERIES FOR ELECTRIC VEHICLES: A LOOK AT THE FUTURE
William J. Walsh 23 Apr. 1979 23 p refs Presented at the APS Meeting, Washington, D.C., 23 Apr. 1979
(Contract W-31-109-eng-38)
(CONF-790484-1) Avail: NTIS HC A02/MF A01

Battery systems which are potential candidates for electric motor vehicles are discussed. These include lead acid, nickel-iron, nickel-zinc, zinc-chlorine, lithium-metal sulfide and sodium-sulfur (ceramic electrolyte). The characteristics of these batteries are discussed. Each individual battery system is found to have less than 50% probability of successful development and commercialization; however, the cumulative probability that at least one of the batteries would be successfully developed is judged to be greater than 75%. It is predicted that the magnitude of the market penetration of electric motor vehicles will depend on the severity of future liquid-fuel shortages along with the cost and quality of the advanced batteries. DOE

N80-14532# Sandia Labs., Livermore, Calif.
DISSOCIATION PRESSURE MEASUREMENTS ON SALTS PROPOSED FOR THERMOCHEMICAL ENERGY STORAGE
Robert W. Carling Jul. 1979 40 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8033) Avail: NTIS HC A03/MF A01

Chemical heat pumps employ salt hydrates, ammoniates, or methanolates for energy storage. The efficient operation of a chemical heat pump depends strongly upon the reaction energies and pressure/temperature relationships of these salts. An apparatus was assembled to measure pressure/temperature relationships and derive reaction energies. A sensitive cantilever balance used to prepare salt samples in situ so that the stoichiometry of the salt hydrate, ammoniate, or methanolate is known prior to the pressure measurements is incorporated in this apparatus. The apparatus is described and results on two systems are presented: MgCl2.nH2O (where n = 6,1, 6, or 4) and CaCl2.nNH3 (where n = 8, 4, 2, or 1). DOE

N80-14533# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
PROCEEDINGS OF THE THERMAL ENERGY STORAGE IN AQUIFERS WORKSHOP
Dec. 1978 134 p refs Conf. held at Berkeley, Calif., 10-12 May 1978
(Contract W-7405-eng-48)
(LBL-8431; CONF-7805140) Avail: NTIS HC A07/MF A01

Contents: thermal energy storage in aquifer workshop; seasonal storage--prospects and problems; hydrogeology and reservoir engineering; energy management objectives and economics of heat storage wells; institutional aspects of utilizing heat storage in aquifers--a proposal for a prototype test; environmental aspects of low temperature thermal energy storage in aquifers; mathematical modeling of thermal energy storage in aquifers; confined aquifer experiment; thermal storage of cold water in ground water aquifers for cooling purposes; air conditioning Kennedy Airport with winter cold; high temperature underground thermal energy storage. R.E.S.

N80-14534# Battelle Pacific Northwest Labs., Richland, Wash.
COMPRESSED AIR ENERGY STORAGE TECHNOLOGY PROGRAM Annual Report, 1978
W. V. Loscutoff Jun. 1979 180 p refs
(Contract EY-76-C-06-1830)
(PNL-2935) Avail: NTIS HC A09/MF A01

Results of studies performed to establish design and stability criteria for compressed air energy storage (CAES) underground reservoirs are presented along with advanced concepts that will eliminate dependence of the CAES concept on petroleum fuels. Reservoirs examined include aquifers, hard rock caverns, and salt caverns. Equipment evaluation and development studies are cited together with feasibility studies of alternative fuels and technologies such as adiabatic systems, hybrid systems utilizing thermal energy storage and fuel, coal fired fluidized processes, and coal fired low Btu gasifiers. J.M.S.

N80-14535# Los Alamos Scientific Lab., N. Mex.
SUPERCONDUCTING MAGNETIC ENERGY STORAGE FOR ELECTRIC POWER SYSTEM DYNAMIC STABILIZATION
Robert Turner 1979 7 p refs Presented at Intersoc. Energy Conversion Conf., Boston, 5 Aug. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1220; CONF-790803-07) Avail: NTIS HC A02/MF A01

A superconducting magnetic energy storage (SMES) system developed for a dynamic stabilizer to be installed in the Bonneville Power Administration (BPA) power system at Tacoma, Washington, by 1982 is described. This unit is an alternate stabilization method to the dc modulator now used to stabilize the 900 mile, ac intertie between BPA and Southern California. The SMES unit consists of a 30 MJ solenoid, a 10 MW convertor, a liquid helium dewar and auxilary systems. The SMS dynamic stabilizer design is presented with status information about the superconducting coil, the converter, and other components of the SMES dynamic stabilizer summarized. DOE

N80-14536# Elliott Co., Jeannette, Pa.
PRELIMINARY DESIGN OF AXIAL FLOW HYDROCARBON TURBINE/GENERATOR SET FOR GEOTHERMAL APPLICATIONS Final Report
N. A. Samurin and J. R. Shields May 1979 179 p refs Sponsored by Elec. Power Res. Inst.
(EPRI-ER-513) Avail: NTIS HC A09/MF A01

The design of a 65 MW (e) gross turbine generator set in which a hydrocarbon gas mixture is used as the motive fluid is outlined. The turbine generator set is part of a geothermal binary cycle electric power plant proposed for the Heber site in the Imperial Valley, California. Aerodynamic design considerations and estimated unit performance for three hydrocarbon gas mixtures are presented. Real gas properties and equations of state are reviewed as they affect the turbine design and the thermodynamic cycle. The mechanical designs for the casing, rotor dynamics, shaft sealing and unit construction are detailed. Support systems such as the lube and seal supply system, turbine controls, etc., are reviewed. An extensive hydrocarbon turbine general specification is also included. DOE

N80-14537# Southern California Edison Co., Rosemead.
COMMERCIAL SOLAR AUGMENTED HEAT PUMP SYSTEM
J. Wilborn Mar. 1979 79 p refs Sponsored by Elec. Power Res. Inst.
(EPRI-ER-1004) Avail: NTIS HC A05/MF A01

A solar energy augmented water source heat pump system was installed on an administration building located on the campus of the Golden West College in Huntington Beach, California. Testing began in mid-1978 and will continue for two years. Solar energy is collected from 600 square feet of solar collector panels mounted on the administration building roof. Buried tanks having a total capacity of 4,000 gallons store thermal energy. A complete and automated operation control system and instrumentation package are included. The system features flexible operation and operates in multiple modes. These modes of operation allow testing with and without solar collectors and with and without thermal storage. Solar augmentation, thermal storage, and heat pumps are to be evaluated. DOE

N80-14538# Sandia Labs., Albuquerque, N. Mex.
DARRIEUS WIND TURBINE PROGRAM AT SANDIA LABORATORIES
P. C. Klimas 1979 12 p refs Presented at Wind Energy Innovative Sys. Conf., Colorado Springs, 23 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0997C; CONF-790501-2) Avail: NTIS HC A02/MF A01

The design and development of vertical axis wind turbines (VAWTs) are discussed. Aerodynamic, structural, testing, and systems analyses capabilites for the development program are reported. The aerodynamic and structural characteristics of the VAWT are presented. A.W.H.

N80-14539# PRC Energy Analysis Co., McLean, Va.
ENGINEERING CONCERNS IN SOLAR SYSTEM DESIGN AND OPERATION
James L. Easterly Mar. 1979 24 p refs
(Contract EG-77-C-01-2522)
(SOLAR/0811-79/01) Avail: NTIS HC A02/MF A01

Engineering concerns associated with the startup and operation of solar heating and cooling installations are discussed. Recommendations are also made regarding the design and installation phases to help in avoiding these problems. DOE

N80-14540# Mound Lab., Miamisburg, Ohio.
STUDIES OF DIRECTLY ABSORBING FLUIDS FOR MID-TEMPERATURE SOLAR THERMAL APPLICATIONS
A. R. Burke, D. E. Etter, C. J. Wiedenhelt, and L. J. Wittenberg 1979 6 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0053)
(MLM-2625-OP; CONF-790541-17) Avail: NTIS HC A02/MF A01

Thermal, photochemical, and optical absorptivity studies at elevated temperatures on various heat transfer fluids containing chromophoric materials are discussed. The solar absorption efficiency of the fluids and chromophores were calculated at ambient and elevated temperatures. Density, viscosity, and heat capacity measurements for specific solutions were determined. Eight chromophoric solutions are identified as candidates for directly absorbing fluids for use up to 300 C. DOE

N80-14541# Mound Lab., Miamisburg, Ohio.
CONSTRUCTION AND INITIAL OPERATION OF THE MIAMISBURG SALT-GRADIENT SOLAR POND
R. S. Bryant, R. P. Bowser, and L. J. Wittenberg 1979 5 p refs Presented at the Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0053)
(MLM-2626-OP; CONF-790541-16) Avail: NTIS HC A02/MF A01

The largest salt-gradient solar pond in the U.S. occupies an area of 2020 sq mi in Ohio and was installed for only $35/sq mi. A technique was successfully demonstrated for the formation of the gradient zone, approximately 1 m thick, in which fresh water was injected horizontally below the surface of the concentrated salt solution. Without any useful heat removed, the storage layer water, approximately 18.5% NaCl, reached a peak temperature of 51.1 C in October 1978 and a minimum temperature of 28.4 C during February 1979. The pond is predicted to deliver 281,000 kW hr/yr to be used principally for heating an outdoor swimming pool in the summer and a recreation building from October to December. The projected heat cost is 2.5 cents/kW hr, based upon amortization of 10%/yr. DOE

N80-14542# Department of Energy, Washington, D. C.
GEOTHERMAL ENERGY: PROGRAM SUMMARY
Jun. 1979 316 p refs
(DOE/ET-0101) Avail: NTIS HC A14/MF A01

Descriptions of geothermal projects for the fiscal year 1978 are presented. Each summary gives the project title, contractor name, contract number, funding level, dates, location, and name of the principal investigator. Objectives and strategies for each program are provided. DOE

N80-14543# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR SMALL WIND SYSTEMS
Louis V. Divone, R. Blaunstein, J. Gros, A. K. Ingberman, W. L. R. Rice, and S. J. Taylor [1979] 46 p refs
(TID-28844-Draft) Avail: NTIS HC A03/MF A01

The commercial readiness of small wind systems is addressed. Barriers to be overcome before this technology is ready to be used commercially are cited and possible actions that might be considered to remove specific barriers are identified. The full implications of the various proposed actions have not been fully developed and many actions listed undoubtedly have substantial problems associated with them. DOE

N80-14544# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR LARGE WIND SYSTEMS
Louis V. Divone, R. Blaunstein, J. Gros, A. K. Ingberman, W. L. R. Rice, and S. J. Taylor [1979] 41 p

(TID-28843-Draft) Avail: NTIS HC A03/MF A01

The commercialization of wind turbines is analyzed concerning technical readiness; market and economic aspects; environmental impacts; institutional acceptance; benefit analysis; and commercialization development strategy. DOE

N80-14545# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR SOLAR WATER HEATING
Frederick H. Morse and J. M. Davis [1979] 35 p refs
(TID-28856-Draft) Avail: NTIS HC A03/MF A01

The commercial readiness of solar hot water heating is discussed. Some barriers to be overcome before this technology is ready to be used commercially are identified. Also identified are possible actions that might be considered to remove specific barriers. Technical, market/economics, environmental, and institutional readiness, and benefits analysis are discussed. DOE

N80-14546# Midwest Research Inst., Golden, Colo.
THERMAL ENERGY STORAGE FOR SOLAR APPLICATIONS: AN OVERVIEW
Charles Wyman Mar. 1979 123 p refs
(Contract EG-77-C-01-4042)
(SERI/TP-34-089) Avail: NTIS HC A06/MF A01

The economic role of storage for solar home heating and stand-alone electric plants are examined. Factors which affect the economics of storage are discussed. The costs and storage capacities of representative sensible and latent heat storage materials are summarized. Various modes of operation are also presented for thermal storage by reversible chemical reactions. Containers and heat exchangers are reviewed to illustrate possible approaches to reducing storage costs. Reversible reaction storage, and gas-solid reactions are shown to have desirable attributes for solar energy storage. DOE

N80-14547# Midwest Research Inst., Golden, Colo.
A REVIEW OF THE ECONOMICS OF SELECTED PASSIVE AND HYBRID SYSTEMS
Deborah L. Buchanan Jan. 1979 27 p refs
(Contract EG-77-C-01-4042)
(SERI/TP-61-144) Avail: NTIS HC A03/MF A01

Performance and economic information on passive and hybrid systems were compiled as part of solar commercial readiness activities. The results of selected performance simulation and cost estimate studies are presented as well as actual cost and performance data from operating buildings. Systems representative of each major passive design concept are included: direct gain, indirect gain (thermal storage wall, thermal storage roof), and isolated gain (convective loop/thermosiphon, attached sunspace/greenhouse). Results are presented in tables structured by major design concept. Data for simulated and actual systems are presented separately. Comparison of individual system design specifications, performance, incremental solar cost, and cost of delivered energy are made by major design concept and by simulated or actual data source. In addition, results are aggregated to derive cost and performance ranges over all data sources, by design concept and by simulated or actual system. DOE

N80-14548# Midwest Research Inst., Golden, Colo.
COMMERCIALIZING SOLAR ARCHITECTURE
Gregory Franta Mar. 1979 38 p refs Presented at SERI Architectural Planning Seminar, Golden, Colo., 10 Jul. 1978
(Contract EG-77-C-01-4042)
(SERI/TP-62-113; CONF-780792) Avail: NTIS HC A03/MF A01

Barriers to solar technology commercialization through architecture are considered. Attitudes of architects, their clients, government officials, and design/construction professionals are discussed along with technical issues related to the environment, building design and construction, operation, and maintenance. Performance evaluation of solar heating and cooling of buildings (SHACOB) and the general lack of technical awareness by architects regarding non-SHACOB technologies (wind, biomass, process heat, and photovoltaic cells) are included. Institutional issues related to law and government and the solar infrastructure are identified as important. Suggestions related to information, development, acquisition, and dissemination, education and training, demonstrations and design competitions, and other actions aimed at integration of solar technology into the total energy-conscious design process are given. J.M.S.

N80-14549# California Univ., Berkeley. Lawrence Berkeley Lab.
THERMAL DEGRADATION OF A BLACK CHROME SOLAR SELECTIVE ABSORBER COATING: SHORT TERM
Carl M. Lampert May 1979 6 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract W-7405-eng-48)
(LBL-8857; CONF-790541-37) Avail: NTIS HC A02/MF A01

The energy absorption properties and chemical microstructure of Chrom Onyx were investigated using electron microscopy and X-ray diffraction techniques. Different temperatures for short annealing times were used to evaluate the coating's temperature resistance limitations, along with possible degradation mechanisms for various stagnation situations. Samples were tested in both air and vacuum. It is concluded that for all practical considerations, black chrome optically degrades between 500 - 600 C during short exposure times. M.G.

N80-14550# Aerospace Corp., El Segundo, Calif.
THE 10 MW SOLAR THERMAL PILOT PLANT DYNAMIC SIMULATION. VOLUME 1: COMPUTER PROGRAM DESCRIPTION
1 Dec. 1978 154 p refs 2 Vol.
(Contract ET-78-C-03-2028)
(ATR-78(7747)-1-Vol-1) Avail: NTIS HC A08/MF A01

A digital computer simulation of a prototype solar 10 MW (electric) pilot power plant near Barstow, California is presented. The simulation program has been designated STMPPS (Solar Ten Megawatt Pilot Plant Simulation). This simulation is operative on the Control Data Corporation (CDC) 7600 digital computer, with use of the CDC SCOPE 2.1 operating system. Logic and analytical details on which the program is based are described. DOE

N80-14551# Aerospace Corp., El Segundo, Calif.
THE 10 MW SOLAR THERMAL PILOT PLANT DYNAMIC SIMULATION. VOLUME 2: COMPUTER PROGRAM SOURCE LISTING
1 Dec. 1978 271 p 2 Vol.
(Contract ET-78-C-03-2028)
(ATR-78-(7747)-2-Vol-2) Avail: NTIS HC A12/MF A01

The actual computer source listing of program STMPPS is presented. All routines specifically developed to simulate the solar thermal pilot plant are included. The listing contains a generous amount of nonprogrammatic comment lines to aid in interpretation of program logic. DOE

N80-14552# Brookhaven National Lab., Upton, N. Y.
EVLAUTION OF PERFORMANCE ENHANCEMENT OF SOLAR POWERED ABSORPTION CHILLER WITH AN IMPROVED CONTROL STRATEGY USING THE BNL-BUILT HARDWARE SIMULATOR
P. C. Auh 1979 5 p refs Presented at the Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-02-0016)
(BNL-26218; CONF-790541-21) Avail: NTIS HC A02/MF A01

Transient and cycling performance characteristics of an advanced, solar absorption chiller were investigated. The results of the various combinations of on/off cycling runs showed that the net capacity loss during the start-up transient period could be significantly reduced when the residual cooling capacity generated during the off-period is compensated to the initial loss. Furthermore, the experimental investigation showed that the performance degradation, due to inherent transient behavior of a chiller, could be significantly improved by a simple control modification. The degree of performance under the modified control mode, as a function of the cycle period and such effects on the integrated chiller performance, were investigated. Under the modified control mode, the need of a large cold-side storage may no longer exist. This may offer significant economical advantages, especially for small residential cooling systems, without sacrifice in their performances. DOE

N80-14553# Miami Univ., Coral Gables, Fla. Clean Energy Research Inst.
FIFTH OCEAN THERMAL ENERGY CONVERSION CONFERENCE, VOLUME 2, SECTIONS 4-5
A. Lavi, ed. and T. N. Veziroglu, ed. Sep. 1978 592 p refs Conf. held at Miami Beach, Fla., 20-22 Feb. 1978
(Grant EG-77-G-05-5550)
(CONF-780236-P2) Avail: NTIS HC A25/MF A01

Contents: ocean thermal energy conversion (OTEC) platform design optimization; considerations in selection of OTEC platform size and configuration; OTEC-1 early ocean test project; preliminary engineering design of an OTEC pilot plant; operational sea state and design wave criteria; OTEC platform station keeping analysis; OTEC cold water pipe design loads; dynamic loads induced by severe storms in elastic cold water pipes attached to OTEC ships by fixed and hinged connections; conceptual design of an OTEC power system using modular heat exchangers; power system module configuration using aluminum heat exchangers. R.E.S.

N80-14554# Miami Univ., Coral Gables, Fla. Clean Energy Research Inst.
FIFTH OCEAN THERMAL ENERGY CONVERSION CONFERENCE, VOLUME 3, SECTIONS 6-7
A. Lavi, ed. (DOE, Washington, D.C.) and T. N. Veziroglu, ed. Sep. 1978 520 p refs Conf. held at Miami Beach, Fla., 20-22 Feb. 1978
(Grant EG-77-G-05-5550)
(CONF-780236-P3) Avail: NTIS HC A22/MF A01

The ocean engineering aspects of the ocean thermal energy conversion (OTEC) program are discussed. Economic and commercialization topics are addressed. Topics include the power system development, the heat exchangers system, alternate power cycles, and biofouling and corrosion effects on the the cold water pipe system. A.W.H.

N80-14555# Miami Univ., Coral Gables, Fla. Clean Energy Research Inst.
FIFTH OCEAN THERMAL ENERGY CONVERSION CONFERENCE, VOLUME 1, SECTIONS 1-3
A. Lavi, ed. (DOE, Washington, D.C.) and T. N. Veziroglu, ed. Sep. 1978 695 p refs Conf. held at Miami Beach, Fla., 20-22 Feb. 1978
(Grant EG-77-G-05-5550)
(CONF-780236-P1) Avail: NTIS HC A99/MF A01

The advancements made in the past year in the ocean engineering aspects of the ocean thermal energy conversion (OTEC) program are described. Commercial plant studies are presented on the power system, coal water pipe system, and the seawater system. Topics discussed include the power system development, the heat exchangers system, alternate power cycles, and biofouling and corrosion effects. A.W.H.

N80-14556# Sandia Labs., Livermore, Calif.
WIND TUNNEL TEST OF A FULL-SCALE HELIOSTAT
S. G. Peglow Jun. 1979 18 p refs
(Contract EY-76-C-04-0789)
(SAND-79-8034) Avail: NTIS HC A02/MF A01

The wind tunnel tests performed on a prototype heliostat are described and a comparison of the data with analytically derived results is presented. The testing, which consisted of obtaining loads, moments, dynamic behavior (via servo accelerometers), and flow visualization for the entire range of operational and survival configurations are discussed. DOE

N80-14557# Sandia Labs., Albuquerque, N. Mex.
HELIOS AND RECONCENTRATORS
C. N. Vittitoe, F. Biggs, L. K. Matthews, and L. O. Seamons 1979 6 p refs Presented at Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract EY-76-C-04-0789)
(SAND-78-1600C; CONF-790511-18) Avail: NTIS HC A02/MF A01

The HELIOS computer code for modeling solar energy collection by reflecting systems is discussed. Extensions to HELIOS which include application to reconcentrators and to the evaluation of heliostats are described. The comparison of HELIOS predictions with image data produced by 23 heliostats and with data from a single facet, chosen partially because of exceptionally large distortion, is discussed. The method of treating reconcentrators is presented. DOE

N80-14558# Sandia Labs., Livermore, Calif.
SYSTEMS STUDIES FOR CENTRAL SOLAR THERMAL ELECTRIC
Oct. 1978 492 p refs Workshop held at Houston, Tex., 27-30 Mar. 1978
(Contracts EY-76-C-04-0789; AT(29-1)-789)
(CONF-780383) Avail: NTIS HC A21/MF A01

Twenty-one articles are presented which focus on the current technical and economic status of central receiver solar thermal electric systems and future program direction. The planning and operational differences which the electric utilities foresee solar electric will encounter are discussed. Methodologies associated with utility network planning and operation are presented. National energy models are discussed along with their implications with respect to the future of various solar electric options. R.E.S.

N80-14559# InterTechnology Corp., Warrenton, Va.
PHOTOVOLTAIC POWER SYSTEMS MARKET IDENTIFICATION AND ANALYSIS Final Report, Jan. 1977 - Feb. 1978
May 1979 551 p refs
(Contract EG-77-C-01-4022)
(HCP/T4022-01) Avail: NTIS HC A23/MF A01

The marketing of near and intermediate term photovoltaic power applications was analyzed. The current uses of photovoltaic systems, both domestic and international, were surveyed and the usage of those systems was projected into the future. Products were defined and a market survey was carried out. A detailed scenario which forecasts sales, barriers to market acceptance, and technological innovations required for proper introduction of the products was developed. DOE

N80-14560# Electric Power Research Inst., Palo Alto, Calif.
ELECTRIC UTILITY SOLAR ENERGY ACTIVITIES, 1978
W. L. York May 1979 197 p
(EPRI-ER-966-SR) Avail: NTIS HC A09/MF A01

The scope of solar energy projects sponsored by electric utilities in the United States is presented. Brief descriptions of 600 projects being conducted by 165 utility companies are given. Also included are a list of participating utilities with information contacts and addresses, a list of utilities with projects designated by category, a list of utilities organized by states, and a list of available reports on utility-sponsored projects. DOE

N80-14561# Department of Energy, Washington, D. C. Div. of Solar Applications Developments.
PHOTOVOLTAIC INCENTIVES OPTIONS
R. M. Terry Aug. 1978 227 p
(HCP/CS-0023) Avail: NTIS HC A11/MF A01

The options available to the Federal Government to encourage adequate growth of the solar photovoltaic industry are identified. Appropriate incentives, strategies and options (combinations of strategies) were identified by defining the policy objectives to be achieved by promoting the growth of the photovoltaic industry. Policy objectives, defined by interpreting: (1) general policy statements on energy policy and on the commercialization of new energy technologies; (2) general and specific policy statements on solar energy and on photovoltaics; and (3) specific photovoltaic program goals, are discussed. The definitions of policy objectives derived from these sources were treated as assumptions for the purpose of this study. A determination of the steps for the attainment of policy objectives is presented. DOE

N80-14562# Argonne National Lab., Ill.
OVERVIEW OF THE DEPARTMENT OF ENERGY'S RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAM FOR THE RECOVERY OF ENERGY AND MATERIALS FROM URBAN WASTE
Alan S. Cohen 1979 15 p refs Presented at the US EPA Res. Symp. on Res. on Gas and Leachate and Landfills and Resource Recovery, Orlando, Fla., Mar. 1979
(Contract W-31-109-eng-38)
(CONF-790373-1) Avail: NTIS HC A02/MF A01

Technological options available for reprocessing waste into fuels, metals, glass, paper, ammonia, glucose, fertilizer, and other

energy-intensive products are discussed with emphasis on some of the approximate 80 projects comprising the Urban Waste Technology Branch's R, D, and D program. Projects are grouped as being primarily related to mechanical, thermal, or biological processes. To date, the majority of R and D funding is devoted to biological processes including anaerobic and enzymatic digestion, energy production and conservation in water and waste water treatment, and energy generation and recovery in sanitary landfills. However, demonstration activities, representing slightly less than half the program effort, are focused on the thermal/mechanical systems. If successful, approximately 3% of the nation's energy needs could be supplied by reprocessing wastes. DOE

N80-14563# Energy Technology Engineering Center, Canoga Park, Calif.
OTEC-1 TEST CONDUCTOR PROGRAM
P. Archbold and J. O. Bates 1978 13 p Presented at Seminar on Testing Solar Energy Mater. and Systems, Washington, D.C., 22 May 1978
(Contract EY-76-C-03-0700)
(CONF-780550-9) Avail: NTIS HC A02/MF A01

The involvement of the test director contractor (TDC) in the OTEC-1 test program is outlined. The preparation for and testing of the initial test heat exchangers and auxiliary equipment are considered. Interfaces, TDC/SIC (Systems Integration Contractor) test relationship, test request, test procedures, data handling, and biofouling laboratory are discussed. DOE

N80-14564# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
RECENT INVESTIGATIONS OF METAL OXIDE/CdTe HETEROJUNCTION SOLAR CELLS
A. L. Fahrenbruch, J. Aranovich, F. Cournoyer, T. Chynoweth, and R. H. Bube 1978 7 p refs Presented at the IEEE Photovoltaic Specialists Conf., Washington, D.C., 5 Jun. 1978
(Contract EY-76-S-03-0326)
(CONF-780619-25) Avail: NTIS HC A02/MF A01

The properties of ZnO and indium-tin oxide (ITO) films both on glass and as components of single crystal p-CdTe based heterojunction solar cells are described. The ZnO films deposited by rf sputtering or spray pyrolysis which can be brought within the desired conductivity range for solar cell performance are discussed. The properties of heterojunctions of n-ITO/p-CdTe prepared by rf sputtering are presented. The results of heat treatments on both ZnO and ITO cells are discussed. DOE

N80-14565# Sandia Labs., Albuquerque, N. Mex.
HAZARDOUS PROPERTIES AND ENVIRONMENTAL EFFECTS OF MATERIALS USED IN SOLAR HEATING AND COOLING (SHAC) TECHNOLOGIES: INTERIM HANDBOOK
J. O. Searcy Dec. 1978 225 p refs
(DOE/EV-0028) Avail: NTIS HC A11/MF A01

General background information related to SHAC systems and codes and standards are given. Materials are categorized according to their functional use in SHAC systems as follows: (1) heat transfer fluids and fluid treatment chemicals; (2) insulation materials; (3) seals and sealant materials; (4) glazing materials; (5) collector materials; and (6) storage media. The information presented includes general properties, chemical composition, thermal degradation products, and thermooxidative products of some commerical materials. Toxic properties and other potential health effects, fire hazard properties, and environmental effects of and disposal methods for SHAC materials are also presented. DOE

N80-14566# PRC Energy Analysis Co., McLean, Va.
SYSTEM TESTS AND APPLICATIONS PHOTOVOLTAIC PROGRAM
May 1979 336 p refs
(Contract EG-77-C-01-4024)
(HCP/T4024-01/15) Avail: NTIS HC A15/MF A01

Progress in developing photovoltaic solar energy conversion systems to reduce dependence on fossil fuels is summarized. Exhibits designed to acquaint the general public to photovoltaics are included along with component field tests conducted to monitor module reliability under actual environmental conditions. Major test facilities are described. DOE

N80-14567# Department of Energy, Washington, D. C.
ENERGY POLICY AND CONSERVATION ACT (PUBLIC LAW 94-163) AS AMENDED BY THE NATIONAL ENERGY CONSERVATION POLICY ACT (PUBLIC LAW 95-619). TITLE 10: ENERGY. CHAPTER 2: DEPARTMENT OF ENERGY. SUBCHAPTER D: ENERGY CONSERVATION. PART 430: ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS
1979 19 p
(DOE/CS-0056) Avail: NTIS HC A02/MF A01

The text of Part B, Energy Conservation Program for Consumer Products Other Than Automobiles, from Energy Policy and Conservation Act as amended by National Energy Conservation Policy Act (PL-619) is presented. The text includes the following subjects: coverage, test procedures, labeling, energy efficiency standards, requirements of manufacturers, effect on other law, rules, authority to obtain information, exports, imports, prohibited acts, enforcement, injunctive enforcement, citizen suits, administrative procedure and judicial review, consumer education, annual report, and authorization of appropriations. DOE

N80-14568# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
PERFORMANCE OF RESIDENTIAL SOLAR HEATING AND COOLING SYSTEM WITH FLAT-PLATE AND EVACUATED TUBULAR COLLECTORS: CSU SOLAR HOUSE 1
W. S. Duff, T. M. Conway, G. O. G. Loef, D. B. Meredith, and R. B. Pratt 1978 8 p refs Presented at Meeting of the Am. Section of the Intern. Solar Energy Soc., Denver, 28 Aug. 1978
(Contract EY-76-S-02-2577)
(COO-2577-16; CONF-780808-24) Avail: NTIS HC A02/MF A01

Measurements in Solar House One at Colorado State University provided comparison data on space heating, water heating, and cooling by systems in which flat plate collectors and evacuated tube collectors were used. Data were procured on 47 days during operation of the flat plate collector and on 112 days when the house was heated or cooled by the evacuated tube collector system. It is concluded that the system comprising an evacuated tubular collector, lithium bromide absorption water chiller, and associated equipment is highly effective in providing solar heating and cooling to a small building, that it can supply up to twice the space heating and several times the cooling obtainable from an equal occupied area of good quality flat-plate collectors, and that a greater fraction of the domestic hot water can be obtained by supplying its heat from main storage. DOE

N80-14569# Colorado State Univ., Fort Collins. Solar Energy Applications Lab.
REALISTIC SIZING OF RESIDENTIAL SOLAR HEATING AND COOLING SYSTEMS
D. S. Ward 1978 10 p refs Presented at Meeting of the Am. Section of the Intern. Solar Energy Soc., Denver, 28 Aug. 1978
(Contract EY-76-S-02-2858)
(COO-2858-14; CONF-780808-23) Avail: NTIS HC A02/MF A01

The accuracy of technical and economic sizing methods for solar heating and cooling systems in specific installations is demonstrated to be strongly dependent upon the accuracy of the input data. Variations in the solar radiation data due to the inherent errors in previous solar measurements, and the difficulty in calculating heating and cooling loads to a desired level of accuracy are shown to result in calculated fractions of the load, f, of values with 10 to 15% errors. For specific installations where the heating load was calculated (and not measured experimentally), the fraction of the load carried by solar could therefore, be calculated to only one significant figure. Similarly, the inability to accurately predict inflation rates and certain other costs of the life cycle of a solar system, in addition to errors in the calculated heating load and fraction of the load, f, were shown to reduce the accuracy of economic costs of a solar system to values of + or - 25%. DOE

N80-14570# Mound Lab., Miamisburg, Ohio.
EVALUATION OF FUEL RESOURCES AND REQUIREMENTS FOR THE MAGNETIC FUSION ENERGY PROGRAM
T. B. Rhinehammer and L. J. Wittenberg 31 Oct. 1978 106 p refs

(Contract EY-76-C-04-0053)
(MLM-2419) Avail: NTIS HC A06/MF A01

The potential tritium requirements in the presently formulated development plan were assessed and possible sources for the required tritium were identified. The availability of lithium was surveyed also because the only practical production method for tritium is the neutron irradiation of lithium. The estimates of world-wide resources of lithium available to supply such an industry are reviewed. Additionally, the isotopic separation techniques for lithium-6 enrichment are discussed. The resources and requirements for mercury are included because of its potential use in a lithium isotopic separation technique. The availability of helium-3 and helium-4 is briefly discussed. R.E.S.

N80-14571# California Univ., Livermore. Lawrence Livermore Lab.
PROCESS DESIGN AND ECONOMIC ANALYSIS OF THE ZINC SELENIDE THERMOCHEMICAL HYDROGEN CYCLE
H. H. Otsuki and O. H. Krikorian 6 Sep. 1978 35 p refs
(Contract W-7405-eng-48)
(UCRL-52546) Avail: NTIS HC A03/MF A01

A detailed preliminary design for a hydrogen production plant was developed based on an improved version of the ZnSe thermochemical cycle for decomposing water. In the latest version of the cycle, ZnCl2 is converted directly to ZnO through high temperature steam hydrolysis. This eliminates the need for first converting ZnCl2 to ZnSO4 and also slightly reduces the overall heat requirement. The ZnSe cycle is driven by a very high temperature nuclear reactor (VHTR) that provides a high temperature (1283 K) helium working gas for process heat and power. The plant is sized to produce 27.3 Mg/Hs/h and requires specially designed equipment to perform the critical reaction steps in the cycle. Conceptual designs were developed for several of the important process steps to make cost estimates. A cycle efficiency of about 40% and a hydrogen production cost of about $14/GJ were obtained. DOE

N80-14572# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PROCEEDINGS OF THE DOE CHEMICAL/HYDROGEN ENERGY CONTRACTOR REVIEW SYSTEMS
Aug. 1978 380 p refs Presented at DOE Ann. Chem. Energy Storage and Hydrogen Energy System Contracts Rev., Baltimore, 16 Nov., 1977
(Contract EC-77-A-31-1035)
(CONF-771131) Avail: NTIS HC A17/MF A01

Chemical/hydrogen energy system contracts were reviewed. The review served as an effective means to (1) give all contracts an insight into the background and objectives of thirty-nine hydrogen-related tasks, (2) show the status of the studies or technical effort, (3) relate any problems that had impeded the progress, and (4) state projected solutions for resolving the identified problems. DOE

N80-14573# Argonne National Lab., Ill.
REVIEW OF INDUSTRIAL PARTICIPATION ON THE ANL LITHIUM/IRON SULFIDE BATTERY DEVELOPMENT PROGRAM
E. C. Gay, W. E. Miller, and R. F. Malecha 1978 30 p refs Presented at 13th IECEC Conf. of the Soc. of Automotive Engr., Detroit, 20-25 Aug. 1978
(Contract W-31-109-eng-38)
(CONF-780852-1) Avail: NTIS HC A03/MF A01

The development and fabrication of industrial cells is reviewed. Industrial cells that contained FeS2 in the positive electrode achieved a specific energy of 100 Wh/kg at a 4 hr discharge rate and a peak power of 100 W/kg. Some of these cells showed good performance for up to 300 deep discharge cycles. Industrial cells that contained FeS in the positive electrode maintained good performance through 1000 deep discharge cycles. Present cell development efforts are directed toward improving specific energy and power in the cells that contain FeS and improving cycle life in cells that contain FeS2. DOE

N80-14574# Solar Energy Information Services, San Mateo, Calif.
ENGINEERS GUIDE TO SOLAR ENERGY
Yvonne Howell and Justin A. Benny Feb. 1979 328 p
(PB-297043/2; SEIS-79/1; ISBN-0-930978-04-8; LC-78-62956) Copyright. Avail: NTIS HC $28.00/MF $28.00 CSCL 13A

Information on solar heating technology is presented. The following subjects are covered: (1) an overview of the six basic solar technologies; (2) a comprehensive discussion of the solar resource, including a compendium of worldwide solar radiation data; (3) an introduction to passive solar technology; (4) extensive discussion of active solar systems, including applications for heating swimming pools, domestic hot water, and space heating; (5) methodology for calculating building heat loss and gain, including worldwide design temperature data; (6) an introduction to solar systems sizing through utilization of the f-chart method, including examples and worksheets; (7) a solar heating product directory divided into four sections: collectors, controls, pumps, and storage. GRA

N80-14575# General Accounting Office, Washington, D. C. Energy and Minerals Div.
COMMERCIALIZING SOLAR HEATING: A NATIONAL STRATEGY NEEDED Report to the Congress
20 Jul. 1979 86 p refs
(PB-297882/3; EMD-79-19) Avail: NTIS HC A05/MF A01 CSCL 13A

The adequacy of the Nation's efforts to commercialize solar heating systems is discussed. Constraints facing the use of solar heating systems, the effectiveness of ongoing efforts to overcome these constraints, and the potential effectiveness of the National Energy Act in encouraging the use of solar heating systems are covered. GRA

N80-14576# Massachusetts Inst. of Tech., Cambridge. Marine Industry Advisory Services.
WAVE POWER SYSTEMS
Norman Doelling 1 Jul. 1979 33 p refs
(PB-299851/6; MITSG-79/16; NOAA-79080910; Opportunity-Brief-15) Avail: NTIS HC A03/MF A01 CSCL 10A

Ocean wave power was investigated as a usable, renewable, alternative energy source. The results suggest that both Salter cams and Cockerell rafts can be designed to convert wave motion to relative mechanical motion and mechanical forces. Mooring problems and costs suggest that Salter cams will be much more expensive than Cockerell rafts. A major problem is converting the available mechanical power to a more useful form, i.e., hydraulic or electric power. Upper limits on the amount of power that can be extracted from waves were investigated along with lower cost bounds. GRA

N80-14577# Ohio State Univ., Columbus. Solar Energy Lab.
OHIO EXPOSITION CENTER SOLAR HOME PROJECT Final Progress Report
R. V. DeVore, P. D. McWana, and D. L. Wineland 15 Jun. 1979 186 p refs
(PB-298541/4; OSU-SEL-5-510X) Avail: NTIS HC A09/MF A01 CSCL 13A

The operation of an active liquid-based 615 square foot solar collector array installed on a 2200 square foot residence is reported. Data are presented for the four solar energy utilization subsystems: domestic hot water, direct solar heating, LiBr water absorption air conditioner, and solar-assisted heat pump. Daily insolation records are included for a one year period. GRA

N80-14578# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
GEOTHERMAL ENERGY MARKET STUDY ON THE ATLANTIC COASTAL PLAIN. ECONOMIC EVALUATION MODEL FOR DIRECT USE OF MODERATE TEMPERATURE, UP TO 250 F, GEOTHERMAL RESOURCES IN THE NORTHERN ATLANTIC COASTAL PLAIN
Richard Weissbrod (Johns Hopkins Univ., Baltimore, Md.), William Barron (Johns Hopkins Univ., Baltimore, Md.), Peter Kroll (Johns Hopkins Univ., Baltimore, Md.), and William J. Toth Jun. 1979 71 p refs
(Contract EX-76-A-36-1008)
(PB-298785/7; APL/JHU/GEMS-003; APL/JHU/QM-79-002)

Avail: NTIS HC A04/MF A01 CSCL 13A

The Geothermal Resource Economic Evaluation System developed to calculate the average cost per million Btu of geothermal energy that is delivered either to residential and commercial users through a community heating system or to industrial process heat users is examined. The basic assumptions and the methods used in the model are presented. Results of the current studies indicate that, under a number of market conditions, i.e., for high-density residential housing or for large industrial users, and for a large range of resource conditions, geothermal energy costs are well below the costs of electrical space heating. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-14579* National Aeronautics and Space Administration. Pasadena Office, Calif.

OZONATION OF COOLING TOWER WATERS Patent

Marshall F. Humphrey (JPL), Kenneth R. French (JPL), and Ronald D. Howe, inventors (to NASA) (JPL) Issued 30 Oct. 1979 5 p Filed 29 Sep. 1978 Supersedes N79-10167 (17 - 01, p 0023) Sponsored by NASA

(NASA-Case-NPO-14340-1; US-Patent-4,172,786; US-Patent-Appl-SN-946992; US-Patent-Class-210-57; US-Patent-Class-210-63Z; US-Patent-Class-422-9) Avail: US Patent and Trademark Office CSCL 13B

Continuous ozone injection into water circulating between a cooling tower and heat exchanger with heavy scale deposits inhibits formation of further deposits, promotes flaking of existing deposits, inhibits chemical corrosion and controls algae and bacteria.

Official Gazette of the U.S. Patent and Trademark Office

N80-14580 Washington Univ., Seattle.

A BOX MODEL STUDY FOR GLOBAL AND REGIONAL SULFUR CIRCULATIONS Ph.D. Thesis

Tsan-Ying Steven Yuen 1979 143 p

Avail: Univ. Microfilms Order No. 7927893

Linear eight-box tropospheric global and regional sulfur mass-balanced models are developed to study the nature of global and regional sulfur circulation and distribution. It is found that the calculated sulfur burdens, concentrations, scale heights, turnover times, SO2/SO4(-2) ratios, scattering coefficients, and scattering optical depths agree well with available data. Comparison of the results in our global and regional models suggest that lower tropospheric sulfur concentrations over pollution regions are one to two orders of magnitude larger than global average values, whereas the upper tropospheric sulfur concentrations over polluted regions are of same order of magnitude as their global counterparts. The radiation calculation indicates that the present albedos of the Earth-atmosphere system in the eastern and middle United States are 13% lower and 11% higher than a clean atmosphere respectively. Dissert. Abstr.

N80-14581*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SULFATE AND NITRATE COLLECTED BY FILTER SAMPLING NEAR THE TROPOPAUSE

Francis M. Humenik, Erwin A. Lezberg, and Dumas A. Otterson Jan. 1980 30 p refs

(NASA-TP-1567; E-073) Avail: NTIS HC A03/MF A01 CSCL 13B

Filter samples collected near the tropopause with an F-106 aircraft and two Boeing 747 aircraft were analyzed for sulfate and nitrate ion content. Within the range of routine commercial flight altitudes (at or below 12.5 km), stratospheric mass mixing ratios for the winter-spring group averaged 0.26 ppbm for sulfate and 0.35 ppbm for nitrate. For the summer-fall group, stratosphere mixing ratios averaged 0.13 ppbm and 0.25 ppbm for sulfate and nitrate, respectively. Winter-spring group tropospheric mass mixing ratios averaged 0.08 ppbm for sulfate and 0.10 ppbm for nitrate, while summer-fall group tropospheric mixing ratios averaged 0.05 ppbm for sulfate and 0.08 ppbm for nitrate. Correlations of the filter data with available ozone data suggest that the sulfate and nitrate are transported from the stratosphere to the troposphere. K.L.

N80-14582# Commission of the European Communities, Luxembourg. Directorate-Gen. Res., Sci. and Ed.

ENVIRONMENT AND THE QUALITY OF LIFE Final Report

1978 460 p refs Partly in ENGLISH, GERMAN and FRENCH

(EUR-5970; ISBN-92-825-0185-X) Copyright. Avail: NTIS HC A20/MF A01

One hundred twenty-seven contracts, conducted between 1973 and 1975, are summarized under six headings. These are epidemiologixal surveys, harmful effects of lead pollution, health effects of micropollutants, ecological effects of water pollutants, remote sensing of air pollution, and establishment of a data bank on environmental chemicals. Epidemiological studies were mostly concerned with the relationship between air pollution and respiratory disease in children. Micropollutant health effects cover a range of substances, including nitrogen compounds, asbestos fibers, detergents, heavey metals, and pesticides with their effects on various tissues. The Environmental Chemical Data and Information Network is also discussed. Author (ESA)

N80-14583# Little (Arthur D.), Inc., Cambridge, Mass.

RESEARCH AND DEVELOPMENT OF METHODS FOR ESTIMATING PHYSICOCHEMICAL PROPERTIES OF ORGANIC COMPOUNDS OF ENVIRONMENTAL CONCERN Final Report, Sep. 1978 - Feb. 1979

Warren J. Lyman, Judith C. Harris, Leslie H. Nelken, and David H. Rosenblatt (Army Med. Bioeng. Res. and Develop. Lab., Fort Detrick, Md.) Feb. 1979 138 p refs

(Contract DAMD17-78-C-8073; DA Proj. 3E1-62720-A-835) (AD-A074829; ADL-C-82426) Avail: NTIS HC A07/MF A01 CSCL 07/3

This study was the first phase of a program designed to prepare a handbook of estimation methods for the environmentally important physicochemical properties of organic chemicals. A review of environmental fate models, hazard ranking schemes, federal regulations and other material led first to the identification of about 50 physicochemical properties of interest. Those properties that are estimable with available methods were then identified; these properties will be included in the handbook to be prepared in the next phase. GRA

N80-14584# Los Alamos Scientific Lab., N. Mex.

ENVIRONMENTAL OPTIONS FOR COAL USE

J. R. Bartlit 1979 13 p refs Presented at Energy and Environ. Technol. Training Conf., Tsaile, Ariz., 29 May 1979

(Contract W-7405-eng-36)

(LA-UR-79-1393; CONF-790550-1) Avail: NTIS HC A02/MF A01

The options for coal development are described and their environmental impacts discussed. The various options for better or worse air pollution controls are discussed including the legal options available for requiring the better (cleaner) levels of control if those are desired. DOE

N80-14585# California Univ., Livermore. Lawrence Livermore Lab.

IMPERIAL VALLEY ENVIRONMENTAL PROJECT: AIR QUALITY ASSESSMENT

D. L. Ermak, R. A. Nyholm, and P. H. Gudiksen Apr. 1979 21 p refs

(Contract W-7405-eng-48)

(UCRL-52699) Avail: NTIS HC A02/MF A01

The potential impact on air quality of geothermal development in California's Imperial Valley is assessed. The assessment is based on the predictions of numerical atmospheric transport models. It is predicted that at the 3000 MW level (with no abatement), the California 1 h standard for H2S(42 micron g/cubed m) would be violated at least 1% of the time over an area of approximately 1500 km squared. An H2S emission rate below 0.8 g/s per 100 MW unit is needed to avoid violations of the standard beyond a distance of 1 km from the source. DOE

N80-14586# Brookhaven National Lab., Upton, N. Y.

INTERRELATIONSHIPS BETWEEN MAN, ENERGY, AND

WATER QUALITY: A NEW METHODOLOGY FOR INTEGRATIVE ANALYSES
E. Kaplan and H. C. Thode, Jr. 9 May 1979 56 p Presented at EPA/STORET User Conf., Bethany, W. Va., 7 May 1979
(Contract EY-76-C-02-0016)
(BNL-26188; CONF-790567-1) Avail: NTIS HC A04/MF A01

County aggregated data for nineteen water quality parameters were examined in terms of their ability to describe qualitative chemical characteristics of water. Anion-cation balances as well as expected relationships between conductivity and other parameters were correctly accounted for. Factor analysis indicated the existence of three principal components describing patterns between metal ions, nonmetal ions, and alkalinity-bicarbonate, respectively. These factors were used in place of the original complete set of water quality parameters in a structural equation approach describing relationships between variables of man's activities. It was found that counties with high industrial electric consumption, farming, and mineral shipments tended to have increased levels of most water quality parameters. It was also found that simpler path diagrams may be indicated to reduce the effects of redundancy in adequately describing energy-water relationships. DOE

N80-14587# Princeton Univ., N. J. Guggenheim Labs. for the Aerospace Propulsion Sciences.
FUNDAMENTAL AND SEMI-GLOBAL KINETIC MECHANISMS OF HYDROCARBON COMBUSTION Annual Report, 1 Oct. 1977 - 30 Sep. 1978
F. L. Dryer and I. Glassman 1 Dec. 1978 30 p refs
(Contract EC-77-S-02-4372)
(COO-4272-3) Avail: NTIS HC A03/MF A01

The development of simplified chemical kinetic models to represent combustion chemistry is discussed. Studies of paraffin, olefin, and alcohol hydrocarbons are reviewed. Appropriate global models are presented and compared with experimental data. The results clearly demonstrate that the turbulent flow reactor facility can be used to develop accurate global models for a variety of important fuels. DOE

N80-14588# Dames and Moore, Los Angeles, Calif.
THE MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF BASELINE ENVIRONMENTAL SURVEY, MAFLA, 1977/1978. VOLUME 2-A: COMPENDIUM OF WORK ELEMENT REPORTS Final Report
26 Jan. 1979 537 p refs
(Contract DI-AA55-CT7-34)
(PB-299686/6; Rept-08699-008-88-Vol-2-A; BLM/YM/ES-79/08-Vol-2-A) Avail: NTIS HC A23/MF A01 CSCL 13B

The surface sediments of the eastern Gulf of Mexico continental shelf were investigated. Samples from two replicate box cores at different stations for each season were taken. A large number of replicates were collected at each of the relatively small amount of stations in order to determine small scale variability. Ancillary data for sediment chemistry and benthic biological studies are provided. R.C.T.

N80-14589# Dames and Moore, Los Angeles, Calif.
THE MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF BASELINE ENVIRONMENTAL SURVEY, MAFLA, 1977/1978. VOLUME 2-B: COMPENDIUM OF WORK ELEMENT REPORTS Final Report
26 Jan. 1979 546 p refs
(Contract DI-AA55-CT7-34)
(PB-299687/4; Rept-08699-008-88-Vol-2-B; BLM/YM/ES-79/09-Vol-2-B) Avail: NTIS HC A23/MF A01 CSCL 13B

The incidence of pathological conditions in representative marine invertebrates in the Mississippi, Alabama, and Florida area were studied. Hydrocarbons and trace metal concentrations in the animals and their surrounding sediments were determined. Demersal fishes were collected during four sampling periods and several undescribed species were discovered. Families containing species of special concern to the Mississippi, Alabama, and Florida area goals are discussed. R.C.T.

N80-14590# Air Pollution Technology, Inc., San Diego, Calif.
EFFECTS OF CONDITIONING AGENTS ON EMISSIONS FROM COAL-FIRED BOILERS: TEST REPORT NO. 1 Final Report, Jan. - Apr. 1978
R. G. Patterson, P. Riersgard, R. Parker, and S. Calvert Apr. 1979 72 p refs 2 Vol.
(Contract EPA-68-02-2628; EPA Proj. EHE624A)
(PB-299191/7; EPA-600/7-79-104A) Avail: NTIS HC A04/MF A01 CSCL 13B

A field performance test of an electrostatic precipitator (ESP) which uses SO3 as the conditioning agent was conducted. The ESP was at an electric utility power plant burning approximately 1% sulfur coal. The ESP performance was characterized in terms of particle collection efficiency and the chemical composition of particulate and gaseous emissions. Fly ash resistivity and dust opacity were also measured. Results show an average increase in overall efficiency from 80% to 95% with injection of the SO3. This is accompanied by a decrease in fly ash resistivity, a decrease in opacity, and an increase in SO3 concentration entering and leaving the ESP. Approximately 80% of the injected SO3 escaped the ESP. GRA

N80-14591# Air Pollution Technology, Inc., San Diego, Calif.
EFFECTS OF CONDITIONING AGENTS ON EMISSIONS FROM COAL-FIRED BOILERS: TEST REPORT NO. 2 Final Report, Apr. - Jul. 1978
R. G. Patterson, J. Long, R. Parker, and S. Calvert Apr. 1979 59 p 2 Vol.
(Contract EPA-68-02-2628; EPA Proj. EHE624A)
(PB-299192/5; EPA-600/7-79-104B) Avail: NTIS HC A04/MF A01 CSCL 13B

A field performance test of an electrostatic precipitator (ESP) which uses LPA 445 and LAC 518 flue gas conditioning agents was performed. The ESP is at an electric utility power plant burning approximately 1% to 2% sulfur coal. The ESP performance was characterized in terms of particle collection efficiency, chemical composition of particulate and gaseous emissions, fly ash resistivity, and dust opacity. Measurements show that there was no significant change in overall efficiency (99.6%) between the conditioned and unconditioned tests. There was some evidence that the conditioning agents reduced entrainment during electrode rapping and possibly improved the fractional efficiency slightly for particles smaller than about 5 micrometers in diameter. GRA

N80-14592# Research Triangle Inst., Research Triangle Park, N. C. Operations Analysis Div.
THE AIR QUALITY DATA HANDLING SYSTEM USER'S GUIDE Final Report
Larry R. McMaster May 1979 896 p refs
(Contract EPA-68-02-3011)
(PB-298998/0; EPA-450/4-79-009) Avail: NTIS HC A99/MF A01 CSCL 09B

Step by step procedures are given for the operation of each program in the Air Quality Data Handling System (AQDHS-2) developed to provide the capability to create and maintain air quality data bases and to retrieve data and generate reports from those data bases. Each program is described. File formats, options, error messages, cataloged JCL (LBM), warning and special instruction, cost considerations, and related programs and procedures are included. GRA

N80-14593# Arizona Univ., Tucson.
FUGITIVE AND FINE PARTICLE CONTROL USING ELECTROSTATICALLY CHARGED FOG Final Report, Oct. 1977 - Dec. 1978
Stuart A. Hoening Mar. 1979 103 p refs
(Grant EPA-R-805228)
(PB-298069/6; EPA-600/7-79-078) Avail: NTIS HC A05/MF A01 CSCL 13B

Control of industrial pollutants using electrostatically charged fog was evaluated on pollutants ranging from silica flour to SO2 and fly ash. Results indicate that: (1) significant suppression of pollution occurs with a minimum of water fog; (2) electrostatic hoods and screens can be used to push or direct pollutants to the proper area for collection; and (3) the system is well suited to control of moving fugitive dust sources where the usual duct and baghouse systems are ineffective or too costly. Development

of charged fog systems for controlling fugitive dust, demonstration testing of the systems in industrial locations, and designing and constructing a high temperature stack simulator for fog gun testing are among the topics considered. GRA

N80-14594# Environmental Measurements, Inc., San Francisco, Calif.
ACCURRACY OF REMOTELY SENSED SO2 MASS EMISSION RATES Final Report, Jun. 1976 - Dec. 1978
R. B. Sperling, M. A. Pesche, and W. M. Vaughan May 1979 62 p refs
(Contract EPA-68-02-2711)
(PB-298077/9; EPA-600/2-79-094) Avail: NTIS HC A04/MF A01 CSCL 13B

Remote sensing data of single-stack power plant emissions and local wind speed were analyzed to determine SO2 mass flux for comparison with EPA referenced methods. Four days of SO2 data were gathered from a moving platform by three upward-viewing remote sensors, two ultraviolet absorption spectrometers and an infrared gas filter spectrometer. Wind velocity data were gathered by a laser Doppler velocimeter (LDV); supplemental data were obtained from a tethered balloon (telemetered) and pilot balloons (optical theodolite). The SO2 mass fluxes were derived from the remote sensing data. Comparisons were made between these SO2 fluxes (averages for 20 minutes and 60 minutes) and those derived from in-stack measurements. GRA

N80-14595# Battelle Columbus Labs., Ohio.
ENVIRONMENTAL ASSESSMENT OF THE FLUIDIZED-BED COMBUSTION OF COAL: METHODOLOGY AND INITIAL RESULTS
Keshava S. Murthy, Herman Nack, and D. Bruce Henschel (EPA) 1978 10 p refs Repr. from J. of Air Pollution Control Assoc., v. 28, no. 3, Mar. 1978 p 213-220 Presented at 70th Ann. APCA Meeting, Toronto, Jun. 1977 Revised Prepared in cooperation with Ind. Environ. Res. Lab.
(Contract EPA-68-02-2138)
(PB-298473/0; EPA-600/J-78-111; Paper-77-26.6-Rev) Avail: NTIS HC A02/MF A01 CSCL 13B

A program being conducted by the U.S. Environmental Protection Agency (EPA), aimed at complete environmental assessment (EA) of the fluidized-bed combustion (FBC) of coal is discussed. It reviews the EA methodology being developed by EPA: (1) identification of current technology and environmental background, including development of a list of the universe of potential pollutants; (2) development of environmental objectives via the Multimedia Environmental Goals chart; (3) comprehensive analysis of emissions from operating FBC systems; (4) assessment of existing control technology analysis of environmental control alternatives, using a Source Analysis Model approach; and (5) identification of further data and technology. GRA

N80-14596# Gulf South Research Inst., New Orleans, La.
DEVELOPMENT OF TREATMENT AND CONTROL TECHNOLOGY FOR REFRACTORY PETROCHEMICAL WASTES Final Report, 2 Feb. 1972 - 28 Feb. 1977
John H. Coco, Elias Klein, Donna Howland, James H. Mayes, and William A. Myers Apr. 1979 238 p refs
(Grant EPA-S-800773)
(PB-299291/5; EPA-600/2-79-080) Avail: NTIS HC A11/MF A01 CSCL 13B

The treatment of biorefractory organic pollutants emanating from petrochemical processing plants was investigated. Specifically, application of the unit operations of (1) carbon adsorption, (2) steam stripping, (3) solvent extraction, and (4) ozonation to a number of process effluents from halogenated hydrocarbon, isocyanate, acetylene, and styrene manufacturing industries was studied. In addition to these unit operation evaluations, an activated carbon was developed from a by-product soot which results from the manufacture of acetylene. Quantities of raw soot were dried, pretreated, pelletized, and activated to yield a product with commercial potential which had about 80 percent as much adsorption capacity as a similar commercial product. GRA

N80-14597# Environmental Protection Agency, Washington, D.C. Facility Requirements Div.
ENVIRONMENTAL ASSESSMENT OF CONSTRUCTION GRANTS PROJECTS
Jan. 1979 75 p
(PB-299209/7; EPA-430/9-79-007; FRD-5) Avail: NTIS HC A04/MF A01 CSCL 13B

The procedures and content for the environmental assessments that are required elements of facilities plans are described. The information is intended for consultants who most often develop these assessments, and citizens and local officials who wish to become more knowledgeable about the issues to be covered in an environmental assessment. GRA

N80-14598# Chamber of Commerce, Houston, Tex.
HOUSTON AREA OXIDANTS STUDY, PROGRAM SUMMARY Final Report
Jul. 1979 391 p
(PB-299638/7; HAOS-26) Avail: NTIS HC A17/MF A01 CSCL 13B

A detailed description of the Houston Area Oxidants Study (HAOS), a comprehensive, regional research program organized to investigate the extent, causes, and impacts of airborne oxidants and haze in the Houston area is presented. Measurements of ozone concentrations were made. Data on local air quality, meteorology, emissions, public health, and socioeconomics were analyzed and the potential impacts of proposed emission control strategies were identified. Program conclusions and results are summarized. Comprehensive summaries of each of the HAOS technical projects are presented. GRA

N80-14599# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
AEROMETRIC DATA ANALYSIS FOR THE HOUSTON AREA OXIDANT STUDY, VOLUME 2 Final Report
F. L. Ludwig and J. Raul Martinez Jul. 1979 332 p refs Prepared for Radian Corp., Houston, Tex.
(SRI Proj. 7106)
(PB-299648/6; HAOS-28-Vol-2) Avail: NTIS HC A15/MF A01; Also available in set of 3 reports HC E12, PB-299646-SET CSCL 13B

The relationships between air quality and meteorological and emissions conditions are considered. Emphasis is given to conditions that seem to be unique to the Houston area. Implications for future air quality studies and control measures are presented. GRA

N80-14600# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
AEROMETRIC DATA ANALYSIS FOR THE HOUSTON AREA OXIDANT STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
F. L. Ludwig and J. Raul Martinez Jul. 1979 58 p Prepared for Radian Corp., Houston, Tex.
(SRI Proj. 7106)
(PB-299647/8; HAOS-27-Vol-1) Avail: NTIS HC A04/MF A01; Also available in set of 3 reports HC E12, PB-299646-SET CSCL 13B

The results of a study to use available data to describe the air quality and meteorological conditions in the Houston area are given. Emissions (both anthropogenic and natural) in the Houston area are also described. The linkages that relate air quality in the Houston area to meteorological and emissions conditions are examined. GRA

N80-14601# Environmental Research and Technology, Inc., Westlake Village, Calif.
PARTICULATE SAMPLING AND ANALYSIS Final Report
S. L. Heisler Jan. 1979 112 p refs Prepared for Radian Corp., Houston, Tex.
(PB-299637/9; ERT-P-5190; HAOS-12) Avail: NTIS HC A06/MF A01 CSCL 13B

Particulate samples were collected at five sites in the Houston area. Particles smaller than approximately 2.5 micrometers aerodynamic diameter were collected at all sites using sequential filter samplers equipped with cyclone preseparators at the inlets. A second sampler without a preseparator was located at the downtown site to collect all particles smaller

than about 15 micrometers diameter. All samples were analyzed gravimetrically to determine ambient mass concentrations. A subset of 264 samples taken during stagnant air or near-stagnant conditions was selected for chemical analysis. The quantities of sulfate, nitrate, and chloride on the samples were determined by ion exchange chromatography. GRA

N80-14602# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
AEROMETRIC DATA ANALYSIS FOR THE HOUSTON AREA OXIDANT STUDY. VOLUME 3: DATA SUMMARIES FOR THE HOUSTON AREA OXIDANT STUDY Final Report
F. L. Ludwig, J. Raul Martinez, and Kenneth C. Niz Jul. 1979 272 p
(Contract DA-1; SRI Proj. 7106)
(PB-299649/4; HAQS-29-Vol-3) Avail: NTIS HC A12/MF A01; Also available in set of 3 reports HC E12, PB-299646-SET CSCL 13B

Results are presented of a study to use data collected during the Houston Area Oxidant Study and other available data to: describe the air quality and meteorological conditions in the Houston area; describe emissions (both anthropogenic and natural) in the Houston area; examine the linkages that relate air quality in the Houston area to meteorological and emissions conditions; and examine some of those conditions that seem to be unique to the Houston area. Implications for future air quality studies and control measures are presented. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-14603* National Aeronautics and Space Administration. Pasadena Office, Calif.
SYSTEM FOR REAL-TIME CRUSTAL DEFORMATION MONITORING Patent
Peter F. MacDoran, inventor (to NASA) (JPL) Issued 9 Oct. 1979 7 p Filed 21 Dec. 1977 Supersedes N78-17529 (16 - 08, p 1043) Sponsored by NASA
(NASA-Case-NPO-14124-1; US-Patent-4,170,776; US-Patent-Appl-SN-863024; US-Patent-Class-343-112D; US-Patent-Class-343-100ME) CSCL 08G

A system is described for use in detecting earth crustal deformation using an RF interferometer technique for such purposes as earthquake predictive research and eventual operational predictions. A lunar based RF transmission or transmissions from earth orbiting satellites are received at two locations on Earth, and a precise time dependent phase measurement is made of the RF signal as received at the two locations to determine two or three spatial parameters of the antenna relative positions. The received data are precisely time tagged and land-line routed to a central station for real-time phase comparison and analysis. By monitoring the antenna relative positions over an extended period of months or years, crustal deformation of the Earth can be detected.

Official Gazette of the U.S. Patent and Trademark Office

N80-14604 Minnesota Univ., Minneapolis.
STUDIES WITH A SMALL SEISMIC ARRAY IN EAST-CENTRAL MINNESOTA Ph.D. Thesis
Stewart Alan Greenhalgh 1979 356 p
Avail: Univ. Microfilms Order No. 7926130

Relative arrival times from 120 mine blasts at distances of 80 to 350 km from the Central Minnesota Seismic Array were statistically analyzed to yield a crustal velocity-depth function for the area. A long range refraction profile, extending from the Mesabi Iron Range in northern Minnesota to the seismic array, was also carried out. A striking feature of the profile is the absence of direct P waves in the distance range 60 to 120 km, suggesting the presence of a fault or fracture zone near 60 km. Dispersion relations for the fundamental mode Rayleigh wave, observed on Mesabi mine blast record, were interpreted to reveal a 1.2 km thick surface layer of shear velocity 2.7 km/s overlying a half space of shear velocity 3.3 km/s. The geologic interpretation of the model is that of the Animikie Group metasediments overlying the Lower Precambrian gneisses and granities. Dissert. Abstr.

N80-14605 Washington Univ., Seattle.
CRUSTAL DEFORMATION IN CENTRAL CALIFORNIA: MULTI-WAVELENGTH GEODETIC OBSERVATIONS AND INTERPRETATIONS Ph.D. Thesis
John Oliver Langbein 1979 213 p
Avail: Univ. Microfilms Order No. 7927822

A precision geodetic experiment was conducted on a segment of the Calaveras fault near Hollister, Calif., which had been previously instrumented for surface creep. The experiment utilized a multi-wavelength distance measuring (MWDM) device which produced daily distance determinations of nine baselines ranging from 3 to 9 km in length with a measurement precision approaching 0.1 micron strain. Analysis of the MWDM data reveals the following: (1) Long-term trends over the 2-1/2 years sampled are consistent with rigid block displacement across the Calaveras fault zone. (2) The present strain release mechanism appears to be episodic aseismic slip on the Calaveras fault with a characteristic time of about one month. (3) Maximal inversion of the baseline displacement shows that Calaveras slip episodes could result from either a small amount of slip distributed over a large fault area or a large amount distributed over a small fault area. Dissert. Abstr.

N80-14606 Washington Univ., Seattle.
THE IMPLICATION OF Pn AMPLITUDES FOR VELOCITY GRADIENTS IN THE UPPERMOST OCEANIC MANTLE Ph.D. Thesis
James Steven McClain 1979 104 p
Avail: Univ. Microfilms Order No. 7927837

The amplitudes of critically refracted (Pn) seismic head waves are compared with those generated by synthetic seismograms to estimate the velocity gradients in the uppermost oceanic mantle. It is shown that the critical temperature gradients for all samples of materials present in the upper mantle (dunite, harzburgite, eclogite) are exceeded by the oceanic geotherm. Therefore, velocity must decrease with depth if the Earth is homogeneous and nonporous. A number of petrologic models are discussed as explanations for the apparent positive velocity gradient at a 65 million year old sea floor site. One possibility is the presence of a basaltic residuum in the upper mantle, decreasing with depth. Another is the possibility of slight serpentinization of the upper mantle with depth, requiring either native or meteoric water to be present in the upper mantle. Dissert. Abstr.

N80-14607 Cornell Univ., New York.
INSTABILITY OF GRAVITY WAVES IN A SHEAR FLOW Ph.D. Thesis
Miguel Folkmar Larsen 1979 77 p
Avail: Univ. Microfilms Order No. 7926923

The behavior of gravity waves propagating through a sheared medium is examined by using an approximate dispersion relation found by the WKB method. It is found that the dispersion relation for gravity waves in an isothermal, inviscid, nonrotating medium with a vertical shear of the horizontal background wind yields the Richardson number criterion for instability. The stability analysis is carried out using a method for plasma processes. Implications for previous analyses of gravity waves in a sheared medium are discussed. The results indicate that an absolute instability occurs when the Richardson number is less than 1/4. It is also found that a convective instability exists when the Richardson number lies between 1/4 and 1/2. The convective instability does not generate turbulence, but does amplify waves propagating through the unstable region. Therefore, it would be expected that turbulence would be maintained when the Richardson number is between 1/4 and 1/20. Dissert. Abstr.

N80-14608*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ROCKET OZONE SOUNDING NETWORK DATA Quarterly Report, Mar. 1977 - May 1977
D. U. Wright, A. J. Krueger, and G. M. Foster (NOAA, Wallops Island, Va.) Wallops Flight Center, Wallops Island, Va. Nov. 1979 34 p

(NASA-TM-73283) Avail: NTIS HC A03/MF A01 CSCL 04A

During the period March 1977 through May 1977, three regular monthly ozone profiles were measured at Wallops Flight Center and three regular monthly ozone profiles were measured at the Churchill Research Range. One additional flight was conducted at Wallops Flight Center in support of Nimbus 4 SBUV. Data results and flight profiles for the period covered are presented. Author

N80-14609# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany).

SPEECHES AND LECTURES DELIVERED ON THE OCCASION OF PROFESSOR DOCTOR WALTER DIEMINGER'S RETIREMENT AS DIRECTOR OF THE MAX-PLANCK INSTITUTE FOR AERONOMY [ANSPRACHEN UND VORTRAEGE ANLAESSLICH SEINER FEIERLICHEN VERABSCHIEDUNG AUS SEIN EM AMT ALS DIREKTOR DES MAX-PLANCK-INSTITUTS FUER AERONOMIE AM 9 UND 10 1975]

G. Plotzer 1977 121 p refs Partly in GERMAN and ENGLISH Lectures presented at Landau, West Germany, 9-10 Jul. 1975 (Rept-55/1977; ISBN-3-540-08327; ISBN-0-38-08327-8) Avail: NTIS HC A06/MF A01

Besides a number of speeches in appreciation of Dr. Dieminger's career, four papers are presented concerning the state of ionosphere and solar-terrestrial physics. Emphasis is on possible explanations for F region behavior during solar eclipses, a description of the ionosphere polar regions which is coherent with sounding observations to date, and on the likely analogy between the Earth's ionosphere and those of other planets. An assessment of Sun-weather relationships and their impact on man's environment is also given. For individual titles, see N80-14610 through N80-14613.

N80-14610# Graz Univ. (Austria). Inst. fuer Meteorologie und Geophysik.

UNSOLVED PROBLEMS OF THE UPPER ATMOSPHERE [UNGELOESTE PROBLEME DER OBEREN IONOSPHERE]

O. M. Burkard *In* Max-Planck Inst. fuer Aeronomie Speeches and Lectures delivered on the occasion of Prof. Dieminger's Retirement 1977 p 53-66 refs In GERMAN (For primary document see N80-14609 05-46)

Avail: NTIS HC A06/MF A01

Ionizing radiation observations made from 1952 to date during solar eclipses are reviewed. An attempt is made to relate solar flux to changes in the electron production rate and recombination coefficient of the upper ionosphere during eclipses. It is noted that the decrease in ion recombination at the beginning of an eclipse and the subsequent recovery following the eclipse are not symmetrical, although total flux density is the same before and after the event. The influence of the uneven distribution of sunspots across the solar disk is offered as a possible explanation for this phenomenon. Author (ESA)

N80-14611# Oulu Univ. (Finland). Abt. fuer Elektrotechnik.

POLAR IONOSPHERE [POLARE IONOSPHERE]

J. Oksman *In* Max-Planck Inst. fuer Aeronomie Speeches and Lectures delivered on the Occasion of Prof. Dieminger's Retirement 1977 p 67-89 refs In GERMAN (For primary document see N80-14609 05-46)

Avail: NTIS HC A06/MF A01

A brief definition of the polar ionosphere is offered, then the results of joint German-Finnish ionospheric observations and soundings are reviewed. Radio frequency absorption and reflection at the polar caps are considered. Satellite observations of electron flux density are cited along with data obtained during balloon-borne measurements. A model of the ionosphere-magnetosphere configuration around the Earth is suggested, taking into consideration solar wind effects, magnetopause currents, and plasmasphere orientation. Variations in the polar ionospheric characteristics are discussed and possible coupling mechanisms between the solar wind and the magnetosphere hypothesized. The need for further data is emphasized. Author (ESA)

N80-14612*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PLANETARY IONOSPHERES [PLANETARE IONOSPHAEREN]

S. J. Bauer *In* Max-Planck Inst. fuer Aeronomie Speeches and Lectures delivered on the Occasion of Prof. Dieminger's Retirement 1977 p 91-99 refs In GERMAN (For primary document see N80-14609 05-46)

Avail: NTIS HC A06/MF A01 CSCL 03B

An analogy is drawn between the Earth's ionosphere and the existence of ionospheres around other planets or natural satellites. An ionosphere is defined as a series of layers (D, E, E1, F2) and their characteristics are discussed. Emphasis is on the role of solar wind impacting with the potential ionosphere and the subsequent chemical and diffusion processes that can be observed. Data from the MARINER and PIONEER space programs are cited concerning measured electron density and ionospheric refractivity of extraterrestrial ionospheres, then an attempt is made to model these atmospheres based on Earth ionosphere theory. Author (ESA)

N80-14613# Appleton Lab., Slough (England).

SUN-WEATHER RELATIONSHIPS: A BRANCH OF SOLAR-TERRESTRIAL PHYSICS

J. W. King *In* Max-Planck Inst. fuer Aeronomie Speeches and Lectures delivered on the Occasion of Prof. Dieminger's Retirement 1977 p 101-114 refs (For primary document see N80-14609 05-46)

Avail: NTIS HC A06/MF A01

Various ways in which the lower atmosphere is influenced by solar phenomena ranging from short lived events such as flares to the 11 year and 22 year sunspot cycles are described. The effects on rainfall, scale height, surface pressure, and geomagnetism are specifically covered. Some important consequences for mankind of these Sun-weather relationships are discussed, including energy budgeting, electricity distribution, food production, and the alleviating of famine. Also considered are inadvertent man-made weather modifications such as electrical power distribution system VLF emissions in the magnetosphere. Finally, the influence of solar cycle induced meteorological effects on the economics of industrialized nations is brought to light. Author (ESA)

N80-14614# Lincoln Lab., Mass. Inst. of Tech., Lexington.

SEISMIC DISCRIMINATION Semiannual Technical Report, 1 Oct. 1978 - 31 Mar. 1979

Michael A. Chinnery 31 Mar. 1979 76 p refs (Contract F19628-78-C-0002; ARPA Order 512) (AD-A073772; ESD-TR-79-41) Avail: NTIS HC A05/MF A01 CSCL 17/10

Lincoln Laboratory has embarked on the task of carrying out the design and specification of a U.S. Data Center which will fulfill U.S. obligations that may be incurred under a possible future Comprehensive Test Ban Treaty. This report includes 17 contributions, relating progress in the Data Center design and associated seismic research. These contributions are grouped as follows: seismic data management system (5 studies), locations and travel times (5 studies), and general seismology (7 studies). Author (GRA)

N80-14615# Dow Chemical Co., Walnut Creek, Calif.

EVALUATION OF ALTERNATE VANADIUM COMPOUNDS FOR USE IN FIBERGLASS REINFORCED PLASTIC SOIL SURFACING Final Report

Theo John West Sep. 1979 35 p refs (Contract N68305-77-C-0005) (AD-A074871; CEL-CR-79.013) Avail: NTIS HC A03/MF A01 CSCL 08/13

The purpose of this investigation was to develop an alternate vanadium compound for the previously used vanadium neodecanoate (Vanadium Ten Cem) in formulating fiberglass-reinforced plastic surfacings. The study was limited to commercially available products. It was found that Accelerator VN-2 can be used in place of Vanadium Ten Cem under dry conditions but is not usable under wet conditions. Vanadyl and vanadium acetylacetonate and vanadyl naphthenate were also evaluated and were ineffective under wet conditions and inferior to Accelerator VN-2 under dry conditions. The flexural strengths of laminates prepared using Accelerator VN-2 at 320 F and 750 F substantially exceeded contract specifications. GRA

N80-14616# Naval Postgraduate School, Monterey, Calif.
POWER SPECTRA OF GEOMAGNETIC FLUCTUATIONS BETWEEN 0.4 AND 40 Hz M.S. Thesis
Frederick William Clayton Jun. 1979 63 p refs
(AD-A074378) Avail: NTIS HC A04/MF A01 CSCL 08/14

Power spectra of the fluctuations of the geomagnetic field were obtained for the frequency range of 0.4-40 Hz using an optically pumped Cesium vapor magnetometer. The spectra display a gradual decrease in slope at low frequencies with zero slope occurring between approximately 5 Hz and 15 Hz followed by a slight increase in slope. Data was collected at local midnight (0000-0200), local morning (0800-1000) and local afternoon (1600-1800). The morning and afternoon specta exhibit what is believed to be a Schumann resonance peak at 8.0 Hz. A peak at 2.2 Hz and its first harmonic (4.4 Hz) were also observed, but are believed to be a man-made phenomenon or a sensor related instrumentation effect. Considerable high frequency disturbances (20-40 Hz) were observed around local midnight and are believed to be ELF: Sferics. A comparison between a magnetically disturbed day (Fredericksburg Index of 7-) and a quiet day (Fredericksburg Index of 2-) at the same time period (0800-1000) showed a difference of 7-9 dB in power spectral density. GRA

N80-14617# Midwest Research Inst., Golden, Colo.
INSOLATION MODELS, DATA AND ALGORITHMS Annual Report, 1978
R. L. Hulstrom Dec. 1978 83 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-36-110) Avail: NTIS HC A05/MF A01

Operational computer models for thermal (broadband) and spectral insolation were developed along with a data base (SOLMET) for the U.S. geographical distribution of thermal insolation. Preliminary research measurements of the thermal insolation on tilted surfaces were performed and a complete design concept of advanced instrumentation to measure automatically the insolation on 37 tilted surfaces at various orientations was developed. DOE

N80-14618# Department of Energy, Washington, D. C. Div. of Solar Technology.
URBAN-RURAL INSOLATION CORRELATION STUDY
Apr. 1979 56 p refs
(DOE/ET-0092) Avail: NTIS HC A04/MF A01

Simultaneous measurements of incident solar radiation from six locations in metropolitan St. Louis, MO, were analyzed. Atmospheric pollutants over the center of metropolitan St. Louis reduced incident all-wave solar irradiation by about 3 percent. At two suburban sites, the irradiation depletion averaged 1 percent and 2 percent for summer and winter seasons, respectively. For cloudless days during the complete experiment, two suburban sites and a rural site north of the city received about 3.5 percent more relative irradiation with north than south winds. The explanation for this wind direction effect is that pollutants were advected from major sources near the city center. With north winds, the suburban and northern rural sites showed about 2 percent to 3 percent more relative irradiation on all days than on cloudless days for both the summer period and the complete experiment. A climatology is presented of hourly measured irradiation averaged over all network sites during the experiment. DOE

N80-14619# Alaska Univ., College. Geophysical Inst.
OPERATION OF A TELEMETERED SEISMIC NETWORK ON THE ALASKA PENINSULA
Feb. 1979 17 p refs
(Contract EY-76-S-06-2229)
(DOE/ER-70006-6; RLO-2229-T6-6) Avail: NTIS HC A02/MF A01

Operation and maintenance of the network on the Alaska Peninsula and the southern offshore area between the Semidi Islands and the western coast of Kodiak Island are discussed. Some of the seismic data obtained during the past few years are shown, and interpretations of the results are given. Data from the network were used for generating fault plane solutions in order to investigate the state of stress in the Benioff zone. Data was also used to invert travel time data into a seismic velocity structure of the area using the Hodhog method. R.C.T.

N80-14620# Los Alamos Scientific Lab., N. Mex.
HOMOMORPHIC PROCESSING OF SEISMIC SIGNALS
J. E. Bralley Jun. 1979 13 p refs
(Contract W-7405-eng-36)
(LA-7876-MS) Avail: NTIS HC A02/MF A01

An introduction to homomorphic processing of time series is presented. The basic concept is discussed and one form of implementation is adduced. Examples of reverberation problems are illustrated. Simple applications to real time series associated with underground nuclear explosions and earthquakes are presented. DOE

N80-14621# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
AN ATTEMPT TO TRIGGER IONOSPHERIC BUBBLES AND EQUATORIAL SPREAD F WITH THE DOUBLE BARIUM CLOUD TECHNIQUE
Gerhard Haerendel Feb. 1979 34 p refs
(MPI-PAE/Extrater st-152) Avail: NTIS HC A03/MF A01

An experiment is described that is expected to trigger an ionospheric bubble in the equatorial F region, i.e. the rise of a flux tube with low plasma content from the bottom of the post sunset F region. The disturbance which will be applied to this region by means of sounding rockets consists of two barium plasma injections at an altitude of 280 km, separated by 50 km in the east-west direction. The low density space between the two clouds is expected to act as the nucleus of bubble formation. It is demonstrated that two conventional barium releases, if placed at the right altitude, are sufficient to create the desired initial perturbation. The development of the bubble can be observed by various optical and radio techniques, such as incoherent scatter, backscatter, ionosonde, and radio scintillation measurements from the ground and from aircraft. The long range perturbations introduced by the rising flux tube will be monitored by airborne airglow measurements in the southern Appleton anomaly. Two rockets will be flown from the Punta Lobos range south of Lima, Peru, on a westward trajectory with a range of about 400 km. Author (ESA)

N80-14622# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
GRAVIMETRIC VERTICAL DEFLECTION DETERMINATION FOR THE NORTH SEA REGIONS (GVDNS 1)
Hans-Georg Wenzel 1978 28 p refs Sponsored by Deut. Forschungsgemeinschaft
(Ser-B-235; ISBN-3-7696-8533-4) Avail: NTIS HC A03/MF A01

Gravimetric vertical deflections were computed for the North Sea region in a grid with 0.25 deg spacing in latitude and 0.5 deg spacing in longitude. Measurements involve combination of GEM 10 spherical harmonics complete to degree and order 22 and 2154 mean free air gravity anomalies in 1 deg by 1 deg blocks and 14185 mean free air gravity anomalies in 6 min by 10 min blocks. The accuracy of the computed gravimetric vertical deflections was estimated to be better than + or - 1 sec by comparison with astrogeodetic vertical deflections around the North Sea. Author (ESA)

N80-14623# National Ocean Survey, Rockville, Md.
PROCEEDINGS OF SECOND INTERNATIONAL SYMPOSIUM ON PROBLEMS RELATED TO THE REDEFINITION OF NORTH AMERICAN GEODETIC NETWORKS
1978 630 p refs Conf. held at Arlington, Va., 24-28 Apr. 1978
(PB-299280/0; NOAA-79072401) Avail: NTIS HC A99/MF A01 CSCL 08E

The progress of the new adjustment of the North American datum since 1974 is discussed. A compilation of the technical papers are presented which cover the redefinition of the horizontal control network of North America. The status, methods and procedures, and future directions of the network are discussed. A.W.H.

N80-14624# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Data and Information Service.
UNITED STATES EARTHQUAKES, 1977
Jerry L. Coffman and Carl W. Stover 1979 87 p refs Prepared jointly with Geological Survey, Reston, Va.

(PB-300863/8; NOAA-79081308) Avail: NTIS HC A05/MF A01 CSCL 08K

Earthquakes that were reported felt in the United States and nearby territories in 1977 are described. Each description includes date, origin time, hypocenter and hypocenter source of the earthquake, maximum intensity (Modified Mercalli), and macroseismic effects reported in the area. A chronological list of earthquakes by state and a summary of macroseismic data reported for each earthquake are presented. Information on crustal movement studies, tsunamis, and principal earthquakes of the world, and 'strong-motion seismograph data' is also presented. GRA

N80-14625# Massachusetts Inst. of Tech., Cambridge. Marine Industry Advisory Services.

TOWARD IMPROVED TECHNIQUES FOR PREDICTING SOIL STRENGTH IN OFFSHORE ENVIRONMENTS

Norman Doelling 1 Jul. 1979 24 p refs

(PB-299960/5; MITSG-79/17; Opportunity-Brief-16; NOAA-79080911) Avail: NTIS HC A02/MF A01 CSCL 08M

Fugro cone and special piezometer probes were used as in situ testing devices for estimating the engineering properties of subsea sites. Theoretical models of the interaction of cones and soils were derived to relate the parameters obtained from the test devices to the engineering properties of soils. The models provided a framework for the analysis and calibration of field test data. Field tests were made at sites which have been studied in detail and whose engineering properties have been studied extensively by other means of field testing, by laboratory tests, and also by hindcasting a planned and calibrated embankment failure. GRA

N80-14626# National Technical Information Service, Springfield, Va.

ATMOSPHERIC ECHO SOUNDING. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1979

Audrey S. Hundemann Sep. 1979 106 p Supersedes NTIS/PS-78/0916; NTIS/PS-77/0815; NTIS/PS-76/0698; NTIS/PS-75/641; NTIS/PS-75/045

(NTIS/PS-0989/8; NTIS/PS-78/0916; NTIS/PS-77/0815; NTIS/PS-76/0698; NTIS/PS-75/641; NTIS/PS-75/045) Avail: NTIS HC $28.00/MF $28.00 CSCL 04B

Abstracts pertaining to equipment, design, and use of acoustic sounders are presented. Use of the sounders to sense the atmosphere for weather changes, temperature inversions, aircraft wakes, ionospheric properties, and other characteristics is discussed. (This updated bibliography contains 98 abstracts, 8 of which are new entries to the previous edition.) GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-14627 Cornell Univ., Ithaca, N. Y.

A UTILIZATION OF THE NESTED GRID APPROACH IN THE DEVELOPMENT OF A SEVERE WEATHER INDEX Ph.D. Thesis

James Thomas Moore 1979 185 p

Avail: Univ. Microfilms Order No. 7926935

A cascade hypothesis of severe storm development is described which is based upon the premise that macroscale systems control when and where mesoscale wave phenomena develop. The nested grid design of numerical modeling is found to be helpful in simulating these scale interactions with a primitive equation model. A flow regime in which subsynoptic scale, upper level subsidence, together with quasi-horizontal dry air advection, forms a subsidence inversion is also hypothesized. At smaller scales of motion, low level convergence and upward vertical motions overwhelm the upper level divergence and release the potential instability established by the macroscale flow. A variety of severe storm case studies are examined which test these hypothesized motions. A severe weather index is then developed which is defined to be the product of the greatest horizontal moisture convergence in the moist layer, the greatest vertical decrease of the equivalent potential temperature in the layer, and the depth of that layer over which it occurs. Dissert. Abstr.

N80-14628 Georgia Inst. of Tech., Atlanta.

METEOR WIND OVER ATLANTA, 34 DEG NORTH, 84 DEG WEST Ph.D. Thesis

Prakash Madhao Dolas 1979 133 p

Avail: Univ. Microfilms Order No. 7926875

Wind data generated by an all sky, continuous wave radio meteor wind facility is analyzed and the horizontal, meridional, and vertical components of the prevailing wind over the height range of 80 to 100 km, at 2 km interval, were obtained. The quasi-periodic warming pulses felt in the stratosphere are singled out as directly influencing the wind regime in the meteor zone. Harmonic analyses of the prevailing wind components show the presence of oscillation with a period of approximately 15 days. An apparent correlation is found between the near 15 day period oscillation in the meteor wind and the high latitude warming pulses in the stratosphere during winter. It is proposed that the mesopause at high latitudes during the winter should exhibit a near 15 day periodicity in temperature. It is also proposed that the extent of the quasi-periodic warmings of the mesopause will depend significantly upon the thermal structure of the stratosphere. Dissert. Abstr.

N80-14629 Florida State Univ., Gainesville.

THE DESIGN OF METEOROLOGICAL FIELD EXPERIMENTS WITH APPLICATIONS TO THE MESOSCALE Ph.D. Thesis

Kenneth Wilcey Johnson 1979 154 p

Avail: Univ. Microfilms Order No. 7926770

A methodology for the optimum placement of multivariate sensors in observation field programs is developed. The methodology relies on spatial correlation estimates, interpolation error estimates as provided by a multivariate optimum interpolation scheme, and a nonlinear programming algorithm. The sensor placement methodology is applied to the design of a mesoscale surface network for the sampling of severe storms. Spatial correlation functions among the variables of wind, pressure, and temperature were computed for use in the placement algorithm. The algorithm indicated that stations added to the existing National Severe Storms Laboratory's mesonetwork should be placed at selective nodes of a grid with a mesh increment of 10 km. Results from these experiments suggest that an inadequate data base exists for the computation of severe storm statistics. The reliability of the experiment design results is reduced as a consequence. Dissert. Abstr.

N80-14630 Oregon State Univ., Corvallis.

A STATISTICAL ANALYSIS OF EXTREME CHINOOKS IN MONTANA AS THEY RELATE TO LARGE SCALE CIRCULATION CHANGES Ph.D. Thesis

Roland Lester Grant 1979 203 p

Avail: Univ. Microfilms Order No. 7927126

Daily changes in the maximum and minimum temperatures were used to identify 36 dates of intense chinooks. A mean chinook situation was identified which indicated that a critical pattern of the surface flow always contained a Polar or Arctic airmass which overspread the prairie areas of Eastern Montana to the Rocky Mountain front just prior to the onset of chinook. On Chinook-Day this surface flow changes to directions from the south-southeast to south-southwest. This surface pattern was accompanied by a strong 500 MB flow from the northwest on Chinook-Day. Dissert. Abstr.

N80-14631 International Solar Energy Society, London (England).

METEOROLOGY FOR SOLAR ENERGY APPLICATIONS

1979 130 p refs Conf. held at London, Jan. 1979

(ISSN-0306-7874) Copyright. Avail: Issuing Activity

The effects of meteorological conditions on the amount of solar radiation reaching the surface for solar energy applications is discussed. Topics include: the radiance distribution of clear and overcast skies, the influence of environmental parameters on flat plate solar collector performance, and climatological values of the turbidity coefficient in the United Kingdom for different classes of radiation. A.W.H.

N80-14632 Washington Univ., Seattle.
SEA BREEZES ON THE ALASKAN ARCTIC COAST Ph.D. Thesis
Thomas Leslie Kozo 1979 207 p
Avail: Univ. Microfilms Order No. 7927819

Atmospheric environmental data collected in August 1976 and 1977 (when nearshore waters are relatively ice free) along the Beauford Sea Coast of Alaska were examined for circumstantial and direct evidence of the existence of sea breezes at 70 N latitude. A numerical, nonlinear, time dependent, two dimensional sea breeze model was formulated using typical measured conditions as input to simulate the dominant physical factors responsible for the atmospheric boundary layer of the wind with height as seen in pilot balloon data. The sea breeze influence on boundary layer turning with height is largely responsible for the increased persistence of surface onshore (northeasterly and easterly) winds documented for the Alaskan arctic coast. The model gave evidence that sea breeze circulation could be strengthened by weak offshore (southwesterly and westerly winds) opposing synoptic winds. The model and data also showed reduced inland penetration of sea breezes with offsetting synoptic winds.
Dissert. Abstr.

N80-14633*# Tennessee Univ. Space Inst., Tullahoma.
PROCEEDINGS, THIRD ANNUAL WORKSHOP ON METEOROLOGICAL AND ENVIRONMENTAL INPUTS TO AVIATION SYSTEMS
Dennis W. Camp, ed. and Walter Frost, ed. Apr. 1979 190 p refs Proc. held at Tullahoma, Tenn., 3-5 Apr. 1979; sponsored by NASA, NOAA, and FAA
(Contract NAS8-32692)
(NASA-CP-2104; FAA-RD-79-49) Avail: NTIS HC A09/MF A01 CSCL 04B

The proceedings of a workshop on meteorological and environmental inputs to aviation systems are reported: The major objectives of the workshop are to satisfy such needs of the sponsoring agencies as the expansion of our understanding and knowledge of the interaction of the atmosphere with aviation systems, the better definition and implementation of services to operators, and the collection and interpretation of data for establishing operational criteria, relating the total meteorological inputs from the atmospheric sciences to the needs of aviation communities. The unique aspect of the workshop was the achievement of communication across the interface of the boundaries between pilots, meteorologists, training personnel, accident investigators, traffic controllers, flight operation personnel from military, civil, general aviation, and commercial interests alike. Representatives were in attendance from government, airlines, private agencies, aircraft manufacturers, Department of Defense, industries, research institutes, and universities. Full-length papers addressed the topics of training, flight operations, accident investigation, air traffic control, and airports. Winds and wind shear; icing and frost; atmospheric electricity and lightning; fog, visibility and ceilings; and turbulence were discussed. For individual titles, see N80-14634 through N80-14640.

N80-14634*# Saint Cloud State Coll., Minn.
METEOROLOGICAL INPUT TO GENERAL AVIATION PILOT TRAINING
John R. Colomy *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 30-36 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

The meteorological education of general aviation pilots is discussed in terms of the definitions and concepts of learning and good educational procedures. The effectiveness of the metoeorological program in the training of general aviations pilots is questioned. It is suggested that flight instructors provide real experience during low ceilings and visibilities, and that every pilot receiving an instrument rating should experience real instrument flight. F.O.S.

N80-14635*# Air Transport Association of America, Washington, D.C.
NEEDED WEATHER INFORMATION WHERE IT BELONGS; IN THE COCKPIT
H. Grady Gatlin *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 37-45 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

The availability of inflight weather data to the cockpit is discussed. The need for real-time information systems to warn of hazardous weather conditions is emphasized. It is suggested that the Weather Service severe weather radar network be collocated with the FAA radar to provide information for real-time decision making. F.O.S.

N80-14636*# National Transportation Safety Board, Washington, D. C.
ACCIDENT INVESTIGATION
Alan I. Brunstein *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 46-57 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

Aircraft accident investigations are discussed with emphasis on those accidents that involved weather as a contributing factor. The organization of the accident investigation board for air carrier accidents is described along with the hearings, and formal report preparation. Statistical summaries of the investigations of general aviation accidents are provided. F.O.S.

N80-14637*# Atlanta Air Route Traffic Control Center, Hampton, Ga.
ATLANTA AIR ROUTE TRAFFIC CONTROL CENTER'S INVOLVEMENT IN AVIATION WEATHER
W. Don Wood *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 58-62 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

The distribution of weather information throughout the Air Traffic Control System is discussed along with the development of meteorological radar, and the modifications to the Air Route Traffic Control Center radars for locating and determining the severity of storms' cells. The planned improvements in the availability of weather data to the control centers are listed. F.O.S.

N80-14638*# Port Columbus International Airport, Ohio.
EFFECT OF WEATHER CONDITIONS ON AIRPORT OPERATIONS
Daniel F. Ginty *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 63-66 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

The effect of adverse weather on airport operations are discussed. The meteorological conditions discussed included rain and hydroplaning, snow and slush, and icing. F.O.S.

N80-14639*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SPANWISE GUST VARIATIONS
John C. Houbolt *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 72-79 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

The spanwise, vertical force, and rolling moment effects of random gusts encountered by aircraft are analyzed. Mathematical models are given for approximating atmospheric turbulence. F.O.S.

N80-14640*# South Dakota School of Mines and Technology, Rapid City.
THE T-28 THUNDER/HAILSTORM PENETRATION AIRCRAFT
John Prodan *In* Tennessee Univ. Space Inst. Proc., 3d Ann. Workshop on Meteorological and Environ. Inputs to Aviation Systems Apr. 1979 p 80-97 (For primary document see N80-14633 05-47)
Avail: NTIS HC A09/MF A01 CSCL 04B

Modifications to the T-28 Aircraft to make it safe for penetrating hailstorms to take scientific measurements are described. F.O.S.

N80-14641*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE STRATOSPHERE: PRESENT AND FUTURE
Robert D. Hudson, ed. and Edith I. Reed, ed. Dec. 1979 443 p refs
(NASA-RP-1049) Avail: NTIS HC A19/MF A01 CSCL 04B

The present status of stratospheric science is discussed. The three basic elements of stratospheric science-laboratory measurements, atmospheric observations, and theoretical studies are presented along with an attempt to predict, with reasonable confidence, the effect on ozone of particular anthropogenic sources of pollution. For individual titles, see N80-14642 through N80-14648.

N80-14642*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LABORATORY MEASUREMENTS
In its The Stratosphere: Present and Future Dec. 1979 p 1-64 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

In addition to kinetic and photochemical data, sections on the following topics as they relate to the stratosphere are presented: heterogeneous chemistry, ionic processes, and infrared spectroscopy. All laboratory data for these areas are discussed in general terms and references to available literature are given. M.M.M.

N80-14643*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELS
In its The Stratosphere: Present and Future Dec. 1979 p 65-81 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

A variety of models used in the study of stratospheric phenomena are examined. Each type of model is important in its own right, and has made a significant contribution to the knowledge stratospheric processes. Particular models allow in-depth study of selected processes and the possibility of developing suitable parameterizations of these processes. Specific attention is given to three important processes: chemistry, radiative transfer, and motions. Since all of these processes depend on solar radiation, models of the Earth's radiation balance and vertical temperature structure are included. M.M.M.

N80-14644*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BUDGETS
In its The Stratosphere: Present and Future Dec. 1979 p 83-142 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

The current knowledge of the sources, sinks, and distributions of those atmospheric species that are important in determining the physical and chemical state of the stratosphere are presented. These species are the halocarbons, nitrous oxide, odd-nitrogen, carbon dioxide, water vapor, methane and nonmethane hydrocarbons, and sulfur compounds. M.M.M.

N80-14645*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADICALS, RESERVOIRS, AND IONS
In its The Stratosphere: Present and Future Dec. 1979 p 143-197 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

A study of those molecules chemically formed in the stratosphere is presented. Included are: (1) a review of the available library of data on those constituents which are currently believed to be of primary importance to stratospheric ozone photochemistry, (2) the identification of emerging problems by comparing calculated and observed concentration profiles of those constituents for which a developing data base exists, such as NO, NO2, HNO3, OP-3, Cl, ClO, OH, HO2, HCl, and ClONO2; and (3) the appraisal of emerging research objectives in the field of observational stratospheric ozone photochemistry. M.M.M.

N80-14646*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METEOROLOGY OF THE STRATOSPHERE
In its The Stratosphere: Present and Future Dec. 1979 p 199-280 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

An assessment is provided as to how far existing observational and theoretical efforts have progressed toward the understanding of stratospheric processes and toward the ability to use this knowledge to predict future states of the stratosphere. In this connection, gaps in present knowledge are pointed out, and the necessary research areas identified. A discussion is given of the present understanding of chemical exchange processes, dynamical coupling processes, radiative interactions, and electrical coupling between the troposphere and stratosphere. The role of stratospheric measurements with an indication of the advantages and shortcomings of various types of data in testing meteorological theories is given. Then, various techniques are discussed for obtaining the geographical and temporal distributions of measured parameters from the collection of discrete measurements that are taken at different locations and times. M.M.M.

N80-14647*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LONG PERIOD CHANGES IN STRATOSPHERIC PARAMETERS
In its The Stratosphere: Present and Future Dec. 1979 p 281-332 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

An attempt is made to determine whether analysis of records can be used to find out what long period changes on the ozone distribution pattern (if any) exist and to what extent (if any) they can be ascribed to human activity. The first problem is purely statistical; that is, to determine the best trend from a set of ozone observations. The second problem involves the interpretations of these trends. The emphasis is on conventional total ozone records, which exist for a relatively long period, but for which the models predict only modest changes. Commentary is made on the vertical distributions of ozone in the upper stratosphere, where predicted changes are large, but where the records are relatively short. Also included are analyses of the evidence for long-term changes in atmospheric temperatures and in trace constituents important to the stratosphere. M.M.M.

N80-14648*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODEL PREDICTIONS
In its The Stratosphere: Present and Future Dec. 1979 p 333-362 (For primary document see N80-14641 05-47)
Avail: NTIS HC A19/MF A01 CSCL 04B

The effects on ozone of anthropogenic sources of CFCl3 and CF2Cl2 are presented along with other forms of pollution identified as being potentially capable of producing significant ozone changes. Predictions are made of effects of ground level releases of CH3CCl3 and of chemicals produced by aircraft, rockets, and atmospheric nuclear explosions. Changes in N2O, H2O, CO and CO2 are also considered. M.M.M.

N80-14649# Ceskoslovenska Akademie Ved, Prague. National Committee of Geodesy and Geophysics.
NATIONAL REPORT: METEOROLOGY FOR 1975-1979
1979 53 p refs Presented at the 17th Gen. Assembly of the Intern. Union of Geodesy and Geophys., Canberra, Australia, 1979
Avail: NTIS HC A04/MF A01

Research activities conducted in 14 Czechoslovakian organizations concerned with weather and climate are summarized. Specific areas of interest include: weather forecasting; ozone distribution; air pollution; the atmospheric boundary layer and ground level; anthropogenic influences on weather and climate; aviation meteorology; cloud physics; atmospheric chemistry; agroclimatology; bioclimatology; the quasibiennial atmospheric cycle; and the hydrological function of forests. Participation in international symposia is also reported. A.R.H.

N80-14650# Committee on Science and Technology (U. S. House).
SEVERE STORMS RESEARCH

Washington GPO 1979 229 p refs Hearings before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., 13-15 Jul. 1979
(GPO-52-135) Avail: Subcomm. on Space Sci. and Applications.

The Subcommittees on Space Science and Applications and the Environment and Atmosphere conducted hearings to better understand what weather forecasting research efforts were currently underway and to assess what efforts should be expended in the future. To accomplish the objective of the investigation, the Subcommittee held hearings at the following facilities: (1) National Severe Storms Forecast Center, Kansas City, Mo.; (2) National Center for Atmospheric Research, Boulder, Colo.; and (3) Space Science and Engineering Center, University of Wisconsin, Madison, Wis. M.M.M.

N80-14651*# Tennessee Univ. Space Inst., Tullahoma.
CURRENT RESEARCH ON AVIATION WEATHER (BIBLIOGRAPHY), 1979
Barry S. Turkel and Walter Frost Jan. 1980 96 p refs
(Contract NAS8-32692)
(NASA-CR-3214) Avail: NTIS HC A05/MF A01 CSCL 04B

The titles, managers, supporting organizations, performing organizations, investigators and objectives of 127 current research projects in advanced meteorological instruments, forecasting, icing, lightning, visibility, low level wind shear, storm hazards/severe storms, and turbulence are tabulated and cross-referenced. A list of pertinent reference material produced through the above tabulated research activities is given. The acquired information is assembled in bibliography form to provide a readily available source of information in the area of aviation meteorology. A.R.H.

N80-14652*# Stanford Univ., Calif. Div. of Applied Mechanics.
STOCHASTIC MODELING OF THE TIME-AVERAGED EQUATIONS FOR CLIMATE DYNAMICS Annual Report, 15 Mar. 1978 - 14 Mar. 1979
J. R. Spreiter 1979 22 p refs
(Grant NsG-5254)
(NASA-CR-162527) Avail: NTIS HC A02/MF A01 CSCL 04B

Two analyses on climate dynamics are presented, both based on a simplified set of barotropic equations for representing large scale non-linear atmospheric circulation characteristics. The statistical properties of the set of equations were investigated for small values of a parameter k sub e, corresponding to the physical case of large zonal westerlies and relatively weak eddy motions. The effect of seasonal type forcing on the solution of these equations was also studied and some preliminary numerical results are presented. R.E.S.

N80-14653# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
RELATIONSHIPS BETWEEN IR EXTINCTION, ABSORPTION AND LIQUID WATER CONTENT OF FOGS
R. G. Pinnick, S. G. Jennings (Manchester Univ., England), Petr Chylek (Harvard Univ., Cambridge), and H. J. Auvermann (New Mexico State Univ., Las Cruces) Aug. 1979 91 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A074395; ERADCOM/ASL-TR-0037) Avail: NTIS HC A05/MF A01 CSCL 04/2

It is well known that atmospheric fog and haze particles degrade the performance of DOD electro-optical sensors. A quantitative assessment of these effects unfortunately requires knowledge of droplet size distributions, which generally have complex spacial and temporal variations. The problem would be simplified considerably if estimates of the radiative properties of fog and haze particles could be made without detailed knowledge of their size distributions. In this report, an attempt is made to find relationships between the radiative properties of fogs and hazes (in particular the volume extinction and absorption coefficients) and their liquid water content, that are relatively independent on droplet size distribution. GRA

N80-14654# Meteorology International, Inc., Monterey, Calif.
METHODS AND PROGRAMS TO UTILIZE SATELLITE INDIRECT SOUNDINGS IN ENVIRONMENTAL ANALYSIS AND PREDICTION Final Report
Manfred M. Holl Sep. 1977 73 p refs
(Contract N00228-76-C-3174; WF52551000)
(AD-A074772; MII-M-225) Avail: NTIS HC A04/MF A01 CSCL 04/2

This report describes CLRBLOK, a comprehensive programmed capability for the diagnosis of blocks of scanlines of multi-channel radiances measured by Special Sensor E of Defense Meteorological Satellite Program spacecraft. The measured radiances are diagnosed for their clear-column radiance components and for the associated estimates of reliability. The solution of the blending system of linear equations is accomplished by application of a novel method: Blending by Weighted Spreading with the algorithm shifting into an SOR mode for those elements which have attained a prescribed criterion of absolute relevance. Also included is a method for assimilating the information in clear-column radiances, weighted as to reliability of the individual radiances and channel calibrations, for direct enhancement of the atmospheric thermal structure. This method includes the option to constrain the thermal structure to be statically stable. These information processing developments are applications of the Fields by Information Blending (FIB). GRA

N80-14655# Marlatt and Associates, Fort Collins, Colo.
ASSESSMENT OF THE APPLICABILITY OF THE NATIONAL FIRE WEATHER DATA LIBRARY TO WIND ENERGY ANALYSES Final Report
W. E. Marlatt, P. Tierney, P. Meilke, M. Baer, and J. Childs May 1979 115 p refs
(Contract EY-76-C-06-1830)
(PNL-2538) Avail: NTIS HC A06/MF A01

A program to review the fire weather library for stations with usable records, develop statistical summaries for selected individual stations and screen summaries for common windy areas, develop statistical comparisons of fire weather stations with nonfire weather stations having multiple observations per day, develop frequency spectra of wind periods above threshold values, and estimate seasonal and geographic distributions of wind energy is described. The use of the data from the program for selection of sites with wind characteristics favorable for maximizing the wind energy potential is discussed. DOE

N80-14656# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE FIFTH PLANNING MEETING FOR THE MONSOON EXPERIMENT MONEX. PART 2: SUMMER MONEX
1979 76 p refs Meeting held at New Delhi, 19-23 Feb. 1979 Prepared in cooperation with Intern. Council of Sci. Unions, Rome
(GARP-Spec-Rept-32) Avail: NTIS HC A05/MF A01; WMO, Geneva SWFR 15

The international MONEX operations plan was discussed in detail. Topics covered include field phase organization and implementation, ship operations, aircraft operations, telecommunication, satellite data acquisition, and radar observation.
Author (ESA)

N80-14657# World Meteorological Organization, Geneva (Switzerland).
REPORT OF THE SECOND SESSION OF THE WAMEX SCIENTIFIC AND MANAGEMENT REGIONAL COMMITTEE
1979 118 p refs In ENGLISH and FRENCH Presented at Douala, United Republic of Cameroon, 26-30 Mar. 1979 Prepared in cooperation with Intern. Council of Sci. Unions, Rome
(GARP-Spec-Rept-33) Avail: NTIS HC A06/MF A01

This conference was the last planning meeting prior to the field phase of the experiment. The significance of the WAMEX program to agricultural and economic problems of African countries was related. The revised draft of the WAMEX implementation/operations plan was discussed, and a final version was adopted. The discussion on scientific planning and research aspects are also summarized. Complementary information is given in ten appendixes. Author (ESA)

N80-14658# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH. REGIONAL ASSOCIATION 4

(NORTH AND CENTRAL AMERICA) HURRICANE OPERATIONAL PLAN
1979 55 p
(WMO-524; ISBN-92-63-10524-3) Avail: NTIS HC A04/MF A01; WMO, Geneva SWFR 23

The purpose of the plan is to enhance the cooperative efforts of members within World Meteorological Organization Region 4 in carrying out their roles in preparing for issuing forecasts and warnings of all tropical cyclones affecting the area. Responsibilities of members are defined. Observational platforms, including land-based radar, satellites and aircraft reconnaissance are discussed. Communication procedures are outlined with special emphasis on headings required to assure proper computer processing and distribution of messages. A list of hurricane names is included. Author (ESA)

N80-14659# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH. WMO TROPICAL CYCLONE PROJECT, SUBPROJECT NO. 6. OPERATIONAL TECHNIQUES FOR FORECASTING TROPICAL CYCLONE INTENSITY AND MOVEMENT
1979 128 p refs
(WMO-528; ISBN-92-63-10528-6) Avail: NTIS HC A07/MF A01; WMO, Geneva SWFR 40

Tropical cyclone climatology, track forecasting methods, forecasting development and changes in intensity, and verification of tropical cyclone forecasts are reviewed in order to provide an up to date summary of the existing prediction techniques. Statistical, empirical, and dynamical techniques are described and their applicability is discussed. The track forecast error characteristics are examined and definitions of the displacement error and the positioning error are given. Author (ESA)

N80-14660# World Meteorological Organization, Geneva (Switzerland).
COMPENDIUM OF METEOROLOGY FOR USE BY CLASS ONE AND CLASS TWO METEOROLOGICAL PERSONNEL. VOLUME 2, PART 3: MARINE METEOROLOGY
Aksel Win-Nielsen, ed. and R. Fotheringham 1979 130 p refs 2 Vol.
(WMO-364) Avail: NTIS HC A07/MF A01

Lecture notes in marine meteorology based on corresponding syllabi for the fundamental training of class one and class two personnel are given. The following areas are covered: physical properties of sea water; dynamics of the upper ocean; heat balance of the ocean; air-sea interaction; water masses, oceanic fronts and thermoclines; platforms and instruments; ocean resources; sea ice; sea waves; swells; tsunamis and storm surges; and underwater acoustics. Author (ESA)

N80-14661# California Univ., Davis. Dept. of Land, Air and Water Resources.
WIND FIELD ANALYSES OF SEVERE STORMS FOR COMPASS (COOPERATIVE OBSERVATIONAL AND MODELING PROJECT FOR THE ANALYSIS OF SEVERE STORMS) Final Report, 1 Jun. 1978 - 31 May 1979
Kit K. Wagner May 1979 25 p refs
(Grant NOAA-04-78-B01-18)
(PB-300298/7; NOAA-79080803) Avail: NTIS HC A02/MF A01 CSCL 04B

A computer program for correlating radar reflectivity patterns at different times was developed. A method of producing three dimensional images with stereo-pair figures was also developed. Combining the two above, a complete procedure for computing three dimensional trajectories in thunderstorms was developed. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-14662 Cornell Univ., New York.
LANGMUIR CIRCULATIONS AS A CONVECTIVE INSTABILITY MECHANISM AND ITS EFFECT ON THE OCEAN MIXED LAYER Ph.D. Thesis
Samuel Paolucci 1979 228 p
Avail: Univ. Microfilms Order No. 7926947

The current system in the stratified upper layer of the ocean is discussed. It is shown that the interaction of the wind-driven current and surface waves produces Langmuir circulation through an instability mechanism for some values of the nondimensional parameters occurring in the problem. A global bound is predicted for stability to two dimensional disturbances of the wind wave mechanism. Comparisons are made between the critical value and the bound for convective instability in order to demark the region of parameter space in which subcritical instabilities are allowable. This region is found to be very small, so that confidence is gained that both the linear and energy theories reasonably capture the essential physics of the onset. By considering three dimensional disturbances, it is shown that the present wind-wave mechanism is most unstable to their two dimensional counterparts, stressing the relevance of the two dimensional finite amplitude numerical computations. Dissert. Abstr.

N80-14663# Naval Postgraduate School, Monterey, Calif.
A STUDY OF THE RELATIONSHIP BETWEEN OCEANIC CHEMICAL MESOSCALE AND SEA SURFACE THERMAL STRUCTURE AS DETECTED BY SATELLITE INFRARED IMAGERY M.S. Thesis
Don Alan Nestor Jun. 1979 93 p refs
(AD-A074186) Avail: NTIS HC A05/MF A01 CSCL 08/10

In recent years the study of ocean fronts and eddies has become increasingly important to the U.S. Navy for they are of vital importance in understanding underwater sound transmission. From the history of satellite pictures for the area of the ocean off the central California coast, it appears that cold water which has come to the surface as a result of upwelling has become intertwined within the California current. The persistent thermal features in the sea surface which are formed were the subject area of this study. Direct telephone contact was established with the satellite receiving station which afforded real time satellite information as to the thermal structure of the sea surface on a mesoscale. This satellite sensed thermal structure was then compared with in situ nutrient and temperature data collected on three cruises on board the research vessel ACANIA. The agreement between the in situ data and the satellite imagery was very strong and the utilization of satellite imagery was shown to be a very effective method to localize an ocean front. GRA

N80-14664# Polar Research Lab., Inc., Santa Barbara, Calif.
ARCTIC RESEARCH IN ENVIRONMENTAL ACOUSTICS (AREA). TECHNICAL REPORT NO. 8: ARCTIC LEAD-AIRDROP DATA BUOY
Beaumont M. Buck, Samuel P. Burke, and John O. Anderson 25 Jul. 1979 22 p refs
(Contract N00014-79-C-0042)
(AD-A074731; PRL-TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/1

Arctic data buoys are capable of data collection that is impractical of accomplishment by manned-station techniques primarily because of high logistics costs. These cost differentials can be even further reduced by buoy paradrop. Size, weight, and power limit the usefulness of such devices, but their most serious drawback has been automatic deployment of sensors under the ice. A new concept which employs a data buoy that is designed for airdrop into open water leads of opportunity, is powered for up to a year's life, and uses the new TIROS-N ARGOS system for position and data recovery which offers promise in solving these problems. The configuration of the buoy, called 'LAD' (Lead Air Droppable), is described along with the results of preliminary Arctic field tests of the concept. Because of the limited nature of those tests, viability of the approach is not yet established, and additional trials are planned for spring 1980. GRA

N80-14665# Naval Research Lab., Washington, D. C. Space Science Div.
OCEAN WAVE SPECTROMETER MEASUREMENTS IN THE GULF STREAM EXPERIMENT Final Report
Davidson T. Chen, Donald L. Hammond, and Paul Bey 20 Aug. 1979 54 p refs
(WF52553000; RR0310343)

(AD-A074369; AD-E000321; NRL-MR-4070) Avail: NTIS HC A04/MF A01 CSCL 08/3

By assuming finite conducting, Gaussian-distributed, statistically stationary and homogeneous ocean surface, the ocean wave spectrometer measurements made in the Gulf Stream Experiment have demonstrated the capability of inferring the directional wave number slope spectra by using the specular point model for look-angles of less than 20 degrees. These measurements have also demonstrated the necessity of independent measurements of wind direction, mean square surface slope, and foam and spray. The results also indicate that at least four independent directional measurements with spatial resolution of 0.1 meters or smaller and spatial coverage of 750 to 1000 meters are necessary. GRA

N80-14668# Naval Environmental Prediction Research Facility, Monterey, Calif.

AIRBORNE EXPENDABLE BATHYTHERMOGRAPH (AXBT) OBSERVATIONS IMMEDIATELY BEFORE AND AFTER PASSAGE OF TYPHOON PHYLLIS IN AUGUST OF 1975 Ph.D. Thesis - Naval Postgraduate School Final Report

William G. Schramm Aug. 1979 45 p

(NR Proj. 083-275)

(AD-A074809; NEPRF-TR-79-05) Avail: NTIS HC A03/MF A01 CSCL 08/10

Ocean thermal response to a major typhoon is analyzed on the basis of data collected during the passage of Typhoon PHYLLIS in August 1975 in the Philippine Sea. This unique set of data was collected using calibrated Airborne Expendable Bathythermographs dropped from a Navy P-3 aircraft. There were three flights: the first was made 14 hours before storm passage, the second 10 hours after passage, and the third two days later. GRA

N80-14667# Centre Oceanologique de Bretagne, Brest (France).

THE ANTIPROD-1 CAMPAIGN ON BOARD THE MARION DUFRESNE, 1-28 MARCH 1977. [CAMPAGNE ANTIPROD 1. MARION DUFRESNE. 1-28 MARS 1977.]

Brest, France Sect. Doc. Centre Oceanog. Bretagne 1978 153 p refs In FRENCH; ENGLISH summary

(CNEXO-16-1978) Avail: NTIS HC A08/MF A01

During the cruise Antiprod I of the supply ship, Marion-Dufresne, the characteristics of planktonic production and of the factors which condition it were studied in the Indian Ocean on the region of influence of the antarctic divergence at the end of the summer. The essential data of the work done in the scope of a descriptive study is presented; 29 stations, situated along a N-S line between 40 and 62 deg S, West of the Kerguelen islands, are mentioned. The most interesting results are the demonstration of an unusual structure in the Antarctic, with Antarctic and subtropical convergencies joining, the marked poverty of phytoplankton since the maximal biomass and the resulting transparency of the waters can be compared to the oligotroph seas, such as the Mediterranean, and the very particular behavior of the silicates which are used up (or are not renewed) much more quickly than the other nutrients when the waters of the divergency drift northwards. Author (ESA)

N80-14668# National Ocean Survey, Rockville, Md. Office of Marine Technology.

THE COST EFFECTIVENESS OF AIRBORNE LASER HYDROGRAPHY

David B. Enabnit, Lowell R. Goodman, G. K. Young, and W. J. Shaughnessy Dec. 1978 63 p refs

(PB-299057/0; NOAA-TM-NOS-26; NOAA-79072308) Avail: NTIS HC A04/MF A01 CSCL 08J

A cost model was developed which gives the cost per unit area of surveying with an airborne laser bathymetric system. Input parameters of the model were estimated and the model was exercised. From the computed cost per unit area of surveying, conclusions are drawn on the potential economic value of laser bathymetry. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-14669 California Univ., San Diego.

KINEMATIC ANALYSIS OF OSMOTIC PROCESSES UNDER NON-EQUILIBRIUM CONDITIONS Ph.D. Thesis

Huacuz Villamar 1979 126 p

Avail: Univ. Microfilms Order No. 7926696

The general conditions for osmotic flow are derived theoretically. It is shown that when a binary mixture is separated from one of its components by means of a barrier permeable only to that same component, a necessary and sufficient condition for the balance of linear momentum in the system is the flow of mass into the mixture, across the semipermeable barrier. The equations for osmotic equilibrium under different sets of forces are derived from the general equation of motion for the osmotic system. It is concluded that the presence of a semipermeable membrane is a sufficient condition for the net motion of the binary mixture from its original equilibrium position, but it is not necessary since the membrane could be substituted by any other 'external' force acting selectively on one of the components of the mixture. It is also concluded that osmotic flow in a binary mixture is a necessary and sufficient condition to balance the linear momentum of the system. The results are applied to a series of membranes of different permeabilities and are used to explain the process of water transport in living organisms.

Dissert. Abstr.

N80-14670# Materials Research Labs., Melbourne (Australia).

MICROBIAL COLONIZATION OF MATERIALS AT INNISFAIL, QUEENSLAND

F. John Upsher Aug. 1979 26 p refs Original contains color illustrations

(MRL-TN-428; AR-001-836) Avail: NTIS HC A03/MF A01

Materials were exposed under a glass canopy to investigate microbial colonization. Two series of exposures were made; one starting in the cool dry winter, the other in the hot-wet season. Growth of microorganisms was slow, particularly of algae which were not apparent until 30 weeks; tardiness was attributed to the samples being protected from rain so that the organisms were dependent upon atmospheric moisture and dew. An increase in the amount of growth was apparent after any week in which the mean relative humidity exceeded 87% or when 80% was exceeded for more than 125 hours. Cotton and wood provided the earliest growth and also supported the greatest amount and variety of fungi. Heavier growths were observed on acrylic paint and poly(vinyl chloride) after prolonged exposure. Cladosporium was the dominant fungal genus, being present on almost every occasion any fungus was detected. R.E.S.

N80-14671*# National Aeronautics and Space Administration, Washington, D. C.

MICROMORPHOLOGY OF NEUROHYPOPHYSIS OF RATS UNDER EXPERIMENTAL CONDITIONS

E. R. Meitner and E. Proksova Dec. 1979 7 p refs Transl. into ENGLISH from Biologia (Bratislava), v. 25, no. 12, 1970 p 857-860 Transl. by SCITRAN, Santa Barbara, Calif.

(Contract NASw-3198)

(NASA-TM-75947) Avail: NTIS HC A02/MF A01 CSCL 06C

The changes of the quantity of neurosecretory substance in neurohypophysis of rats under various experimental conditions are investigated. Comparing to the norm the quantity of neurosecretion after a long stay in the dark was larger. In animals subjected to immobilization stress the picture of neurohypophysis remained unchanged. It changed only in correlation with the administered water. Results indicate that the immobilization stress, in contradistinction to dolorose stress, has no substantial influence upon the quantity of neurosecretion in neurohypophysis. R.C.T.

N80-14672*# National Aeronautics and Space Administration, Washington, D. C.

RNA CONTENT IN MOTOR AND SENSORY NEURONS AND SURROUNDING NEUROGLIA OF MOUSE SPINAL CORD UNDER CONDITIONS OF HYPODYNAMIA AND FOLLOWING NORMALIZATION

V. A. Brumberg and L. Z. Pevzner Dec. 1979 15 p refs Transl. into ENGLISH from Tsitologiya (USSR), v. 10, no. 11, 1968 p 1452-1459 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Academy of Sci. (Leningrad)

(Contract NASw-3199)
(NASA-TM-75983) Avail: NTIS HC A02/MF A01 CSCL 06C

Male white mice were subjected to two and three week hypodynamia and then decapitated. Cytoplasmic RNA content per cell was measured by means of ultraviolet cytospectrometry. Changes in RNA content are shown, and the dynamics of the reparative processes of cells are discussed. R.C.T.

N80-14673*# National Aeronautics and Space Administration, Washington, D. C.
THE EFFECTS OF HYPODYNAMIA AND HYPOKINESIA ON THE ARTERIAL BED OF PELVIC LIMB MUSCLES IN THE RABBIT
N. E. Sokolov Dec. 1979 9 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. Embriol. (USSR), v. 62, no. 4, 1972 p 48-52 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Pavlov First Leningrad Medical Inst.
(Contract NASw-3199)
(NASA-TM-75984) Avail: NTIS HC A02/MF A01 CSCL 06C

The effects of hypodynamia on the arterial bed in the muscles and adjacent structures in limbs of rabbits were subject to investigation. Anatomical methods of study showed that hypodynamia produced morphological changes in the intraorganic arterial system in the muscles, fascia, and adipose tissue of the immobilized limb. These changes proved stable and were retained for six months. Author

N80-14674*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF RHYTHMIC PHOTOSTIMULATION ON MONKEYS WITH HYPERKINESIS OF POST-ENCEPHALITIC GENESIS
I. V. Danilov (USSR Academy of Medical Sciences) and N. N. Kudrayatseva (USSR Academy of Medical Sciences) Dec. 1979 12 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR, (USSR), v. 68, no. 4, 1972 p 511-516 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75986) Avail: NTIS HC A02/MF A01 CSCL 06C

In hyperkinetic monkeys a response opposite to that of healthy monkeys was observed during rhythmic photostimulation (frequency 3, 9, 18, 20, and 25/sec), i.e., the hyperkinesis disappeared. The significance of rhythmic excitatory cycles for interconnections between different brain structures is discussed. Author

N80-14675*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A CONTROLLED RATE FREEZE/THAW SYSTEM FOR CRYOPRESERVATION OF BIOLOGICAL MATERIALS
V. J. Anselmo and R. G. Harrison 1 Jun. 1979 182 p Prepared for Union Carbide Co.
(Contract NAS7-100)
(NASA-CR-162531; JPL-Pub-79-91) Avail: NTIS HC A09/MF A01 CSCL 06B

A system which allows programmable temperature-time control for a 5 cc sample volume of an arbitrary biological material was constructed. Steady state and dynamic temperature control was obtained by supplying heat to the sample volume through resistive elements constructed as an integral part of the sample container. For cooling purposes, this container was totally immersed into a cold heat sink. Sample volume thermodynamic property data were obtained by measurements of heater power and heat flux through the container walls. Using a mixture of dry ice and alcohol at -79 C, sample volume was controlled from +40 C to -60 C at rates from steady state to + or - 65 C/min. Steady state temperature precision was better than 0.2 C while the dynamic capability depends on the temperature rate of change as well as the thermal mass of the sample and the container. R.C.T.

N80-14676*# National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.
INVESTIGATION OF EFFECTS OF TEMPERATURE, SALINITY, AND ELECTRODE DESIGN ON THE PERFORMANCE OF AN ELECTROCHEMICAL COLIFORM DETECTOR
David C. Grana Nov. 1979 54 p refs
(Contract EPA-IAG-D7-0053)
(NASA-TM-80130; EPA-600/4-79-075) Avail: NTIS HC A04/MF A01 CSCL 06B

The results of two research programs to determine the optimum detector design for measuring fecal coliforms in saline waters for operational systems are presented. One program was concerned with the effects of temperature and salinity on endpoint response time, and the other, the interaction between electrode configurations and the test organisms. Test results show that the endpoint response time is related to salinity and seawater temperature; however, these results can be minimized by the correct choice of growth media. Electrode configurations were developed from stainless steel, Parlodion-coated stainless steel, and platinum that circumvented problems associated with the commercial redox electrodes. M.G.

N80-14677# European Space Agency, Paris (France).
BIOLOGY AND MEDICINE IN SPACE: RESEARCH OPPORTUNITIES OFFERED BY SPACELAB. AN INVITATION TO EUROPEAN INVESTIGATORS
Hilding Bjurstedt, ed. Aug. 1979 56 p refs
(ESA-BR-01) Avail: NTIS HC A04/MF A01; ESA, Paris FF 50

The results and experience gained from experiments in space, the current position, and the research opportunities envisaged for the future are reviewed by biologists and medical scientists for the purpose of encouraging investigators to propose experiments, and to disseminate information to the life sciences community. The main subjects covered are: Spacelab, areas of research opportunity, human physiology, cell and developmental biology, plant biology, radiobiology, exobiology and bioengineering. Author (ESA)

N80-14678# Advisory Group for Aerospace Research and Development, Paris (France).
RECENT ADVANCES IN AERONAUTICAL AND SPACE MEDICINE
Raymond H. Murray, ed. (Mich. State Univ., East Lansing) Sep. 1979 80 p refs In ENGLISH and FRENCH Presented at the Aerospace Med. Panel's Spec. Meeting, Brussels, 22-26 Jan. 1979
(AGARD-CP-265; ISBN-92-835-0250-7) Avail: NTIS HC A05/MF A01

The selection and life support of aircrews and spacecrews, including the European payload specialists for shuttle/Spacelab missions are discussed. Physiological factors in space operations are examined, as well as the medical and physiological problems addressed during the development and operation of commercial supersonic vehicles. For individual titles, see N80-14679 through N80-14683.

N80-14679# Advisory Group for Aerospace Research and Development, Paris (France).
PROBLEMS RELATED TO MEDICAL CRITERIA FOR THE SELECTION OF MILITARY NAVIGATION PERSONNEL [PROBLEMES RELATIFS AUX CRITERES MEDICAUX DE SELECTION DU PERSONNEL NAVIGANT MILITAIRE] c52
E. Evrard *In its* Recent Advan. in Aeron. and Space Med. Sep. 1979 22 p refs In FRENCH (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

Visual, auditory and vestibular, and psychological or psychiatric criteria for personnel selection are considered. Specific problems discussed relate to (1) special possible criteria for determining precociousness and the immediate problem of the specialization of operational personnel; (2) a possible raising of the standards for aviators destined to pilot new generation fighter aircraft; and (3) female navigational personnel. The standardization of visual and auditory criteria is recommended as well as additional research on the problems considered in order to reduce the rate of elimination during the pilot training course. Transl. by A.R.H.

N80-14680# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
AN ADVANCED OXYGEN SYSTEM FOR FUTURE COMBAT

AIRCRAFT c54
J. Ernsting *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 17 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

The operational and physiological requirements for an advanced oxygen system for future high performance combat aircraft are considered and reviewed. It is concluded that such an oxygen system should employ a molecular sieve on board oxygen generation system, pressure premix for dilution of the oxygen by air and a twin demand regulator package. The principles of operation of such a system are considered and a design is proposed. Author

N80-14681# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bonn (West Germany). Inst. fuer Flugmedizin.
THE EUROPEAN APPROACH TO THE SELECTION AND TRAINING OF SL PAYLOAD SPECIALISTS c53
K. E. Klein and J. R. Hordinsky *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 12 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

The completed selection of European payload specialists (PS) for the first Spacelab mission (SL-1) is described. Future developments in European selection programs are projected. The immediate training requirements for the SL-1 PS are described. The integration of such varied training categories as biomedical and physical with the more general SL experiment training is reviewed. The usefulness of mission simulations is also discussed. Author

N80-14682*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL FACTORS IN SPACE OPERATIONS. EMPHASIS ON SPACE SHUTTLE c52
Sam L. Pool, Paul C. Rambaut, and Jerry L. Homick *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 12 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01 CSCL 06P

Problems such as space motion sickness, redistribution of body fluids, and cardiovascular deconditioning are of concern in short-duration space shuttle flights. The expanded participation of nonastronaut crewmembers or payload specialists in these flights increases the life scientists' interest in the space shuttle flights. Problems such as loss of skeletal mass, decreased red blood cell production, and numerous endocrine changes are of more concern on long-duration flights. The Life Sciences Program is therefore concerned with a wide variety of problems that range from the applied to the basic. The common thread is biology; the context is space. Several physiological factors associated with space shuttle operations are summarized including space motion sickness, cardiovascular deconditioning, bone and muscle loss, hematology, fluid and electrolyte changes, reentry g-forces, radiation safety, noise, atmosphere, extravehicular activity, toxicology, nutrition, biowaste, and health maintenance. Author

N80-14683# Medical de l'Aeronautique Civile, Paris (France).
SUPERSONIC AERIAL TRANSPORT: MEDICAL AND PHYSIOLOGICAL ASPECTS [LE TRANSPORT AERIEN SUPERSONIQUE ASPECTS MEDICO-PHYSIOLOGIQUES] c52
Jean Raboutet *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 7 p In FRENCH (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

From 1964 to 1974, two medical subgroups, one French and one British, researched the medical and physiological problems presented by supersonic air transportation. All the problems were addressed by committees of specialists that included physicians, physicists, chemists, and engineers. Thus, the loss of pressurization, ozone, ionizing radiation, noise, visual problems, and air conditioning were the objects of profound study. Very satisfying solutions were found. In certain cases, notably ozone and cosmic radiation, it could be proved that it was a matter of false problems, and that supersonic flight at 17,000 meters offered no danger. As the consequence of all the favorable results obtained, the Concorde could easily obtain the authorization necessary for flight.
Transl. by A.R.H.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-14684* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTRA-OCULAR PRESSURE NORMALIZATION TECHNIQUE AND EQUIPMENT Patent
Edward F. Baehr, inventor (to NASA) Issued 12 Jun. 1979 5 p Filed 31 Aug. 1977 Supersedes N77-30736 (15 - 21, p 2839)
(NASA-Case-LEW-12955-1; US-Patent-4,157,718; US-Patent-Appl-SN-829318; US-Patent-Class-128-276) Avail: US Patent and Trademark Office CSCL 06B

A method and apparatus is described for safely reducing abnormally high intraocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biassed diaphragm type is provided with additional bias by a column of liquid. The hypodermic needle can be safely inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small second bleed path provided between the pressure regulator and the hypodermic needle.
Official Gazette of the U.S. Patent and Trademark Office

N80-14685 Kansas State Univ., Manhattan.
MODELING OF BLOOD FLOW IN VESSELS OF THE MICROCIRCULATION Ph.D. Thesis
Pattarapan Prasassarakich 1979 178 p
Avail: Univ. Microfilms Order No. 7926572

A mathematical model of blood flow in rigid straight cylindrical and tapered tubes was developed. The similarity between blood flow in small vessels with oil water flow in glass tubes was investigated. A concentric annular flow (CAF) model with a cell free plasma layer surrounding a continuous core of cells was proposed to describe blood flow in small tubes < 400 micrometers. The resulting pressure flow behavior calculated from this model agrees very well with experimental results. The plasma layer was found to be a constant; independent of shear stress, tube diameter, and feed hematocrit. Results also indicate that the CAF model qualitatively predicts the Fahraeus effect and quantitatively predicts the Fahraeus-Lindqvist effect.
Dissert. Abstr.

N80-14686 California Univ., Riverside.
THE INTERACTION OF OZONE WITH THE HUMAN ERYTHROCYTE Ph.D. Thesis
Alan Edward Koontz 1979 246 p
Avail: Univ. Microfilms Order no. 7924289

In order to examine the biochemical events of oxidant injury which lead to edema, the human red blood cell studied after exposure in vitro to high concentrations (45 nMoles or O3/10 to the 6th power cells maximum) of oxone for short periods. Changes in outdated cells, pre-incubated with adenosine to restore ATP levels, in outdated cells not pre-incubated, and in resealed ghosts produced from the outdated cells are described. The sensitivity of certain membrane sites such as glyceraldehyde-3-phosphate dehygrogenase and the ouabain binding site evidences the reactivity of oxone with a relatively small number of membrane components, which may be responsible for the generation of a permeability change, cation pump inhibition, or membrane structural modification in the absence of gross internal oxidation, leading to edematous conditions in red cells and other tissues exposed to oxidants. Dissert. Abstr.

N80-14687* National Aeronautics and Space Administration. Pasadena Office, Calif.
DIALYSIS SYSTEM Patent
William A. Mueller, inventor (to NASA) (JPL) Issued 13 Jun.

1978 6 p Filed 28 Feb. 1977 Sponsored by NASA
(NASA-Case-NPO-14101-1; US-Patent-4,094,775;
US-Patent-Appl-SN-772434; US-Patent-Class-210-22;
US-Patent-Class-210-321B) Avail: US Patent and Trademark Office

The improved hemodialysis system utilizes a second polymeric membrane having dialyzate in contact with one surface and a urea decomposition solution in contact with the other surface. The membrane selectively passes urea from the dialyzate into the decomposition solution, while preventing passage of positively charged metal ions from the dialyzate into the solution and ammonium ions from the solution into the dialyzate.

Official Gazette of the U.S. Patent and Trademark Office

N80-14688*# National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF PROLONGED HYPOKINESIA ON TISSUE BLOOD FLOW

Z. P. Levites and V. F. Fedotova Dec. 1979 7 p refs Transl. into ENGLISH from Eksp. Khir. Anesteziol. (USSR) no. 3, May/Jun. 1974 p 79-80 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198;
(NASA-TM-76005) Avail: NTIS HC A02/MF A01 CSCL 06P

The influence of hypokinesia on the blood flow in the tissues of rabbits was studied. Motor activity of animals was restricted during 90 days and blood flow recorded through resorption rate of NaI-131. Perfusion of tissues under the influence of hypokinesia was found to be reduced. Author

N80-14689*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SYNTHESIS AND BIOLOGICAL SCREENING BY NOVEL HYBRID FLUOROCARBON HYDROCARBON COMPOUNDS FOR USE AS ARTIFICIAL BLOOD SUBSTITUTES Second Annual Report, Jul. 1977 - Jul. 1978

J. Mosconin, K. Scherer, A. Toronto (Utah Biological Test Lab., Salt Lake City), D. Lawson, T. Terranova, A. Yavrouian, L. Astle (Utah Biological Test Lab., Salt Lake City), S. Harvey (Utah Biological Test Lab., Salt Lake City), and D. H. Kaelble (Rockwell Intern., Thousand Oaks, Calif.) 15 Oct. 1979 276 p refs Sponsored in part by NIH
(Contract NAS7-100)
(NASA-CR-162537; JPL-Pub-79-36) Avail: NTIS HC A13/MF A01 CSCL 06A

A series of hybrid fluorochemicals of general structure R(1)R(2)R(3)CR(4) was prepared where the R(i)'s (i = 1,2,3) is a saturated fluoroalkyl group of formula C sub N F sub 2n+1, and R(4) is an alkyl group C sub n H sub 2n+1 or a related moiety containing amino, ether, or ester functions but no CF bonds. Compounds of this class containing approximately eight to twenty carbons total have physical properties suitable for use as the oxygen carrying phase of fluorochemical emulsion artificial blood. The chemical synthesis, and physical and biological testing of pure single isomers of the proposed artificial blood candidate compounds are included. Significant results are given. R.C.T.

N80-14690# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

DERIVATION OF PRESBYCUSIS AND NOISE INDUCED PERMANENT THRESHOLD SHIFT (NIPTS) TO BE USED FOR THE BASIS OF A STANDARD ON THE EFFECTS OF NOISE ON HEARING

Daniel L. Johnson Sep. 1978 53 p refs Sponsored in part by EPA
(AF Proj. 7231)
(AD-A071310; AMRL-TR-78-128) Avail: NTIS HC A04/MF A01 CSCL 06/19

This report provides various sets of tables that attempt to summarize much of the existing knowledge of the expected effects of noise on the hearing threshold levels of a population. Relations between noise exposure and Noise Induced Permanent Threshold Shift (NIPTS) for different audiometric frequencies are provided. Six different data sets of presbycusis (the effects of aging on hearing thresholds) are provided. Details for combining the effect of NIPTS to different presbycusis bases are provided. Three methods are suggested for presentation of hearing loss data. These are: (1) direct use of NIPTS, (2) calculation of hearing risk (the change in percent of the population whose hearing exceeds a certain value, and (3) use of a value (called units of potential compensation) that is related to the total compensation that might be paid due to hearing loss. The last method is new and was developed especially because of criticisms of the first two methods. The combined average of the frequencies of 500 Hz, 1000 Hz, 2000 Hz and 3000 Hz are analyzed in great detail and 10 tables are provided for describing the effects of noise on this frequency combination. A computer program for calculating hearing risk and units of potential compensation is provided. GRA

N80-14691# Army Research Inst. of Environmental Medicine, Natick, Mass.

THREE INSTRUMENTS FOR ASSESSMENT OF WBGT AND A COMPARISON WITH WGT (BOTSBALL)

B. Onkaram, L. A. Stroschein, and R. F. Goldman 14 Sep. 1979 28 p refs
(DA Proj. 3E1-62777-A-845)
(AD-A074979; USARIEM-M-24/79) Avail: NTIS HC A03/MF A01 CSCL 06/19

Environmental heat stress, expressed as the ambient wet bulb globe temperature (WBGT), was measured using three different WBGT instruments: (a) the conventional shaded dry bulb, 15.2 cm black globe and naturally convected wet bulb thermometers; (b) a miniaturized thermometer kit; (c) a commercial WBGT instrument using thermistor sensors, and the WBGT was compared with (d) the ambient wet globe temperature (WGT) measured by a Botsball. Visual observations were made on the instruments at regular intervals and an automated data collection system was also used to obtain data from thermocouples attached to the instruments. Statistically significant differences in WBGT readings were found among the instruments; however, the difference for a given environment was usually less than 0.5 C. Readings taken by visual observations resulted in WBGT values which differed by less than 0.3 C from those calculated from the automated data collection system. By using an equation derived for the Botsball, WBGT - 1.044 WGT - 0.187 in C, it is possible to convert the Botsball thermometer dial to indicate the conventional WBGT for outdoor environments; it then becomes a simple instrument for assessing environmental heat stress at the work site. GRA

N80-14692# Anthropology Research Project, Yellow Springs, Ohio.

ANTHROPOMETRIC SIZING, FIT-TESTING AND EVALUATION OF THE MBU-12/P ORAL-NASAL OXYGEN MASK

Milton Alexander (Aerospace Med. Res. Lab.), John T. McConville, and Ilse Tebbets Wright-Patterson AFB ARML Aug. 1979 33 p refs
(Contract F33615-79-C-0511; AF Proj. 7184)
(AD-A074723; AMRL-TR-79-44) Avail: NTIS HC A03/MF A01 CSCL 06/17

This report describes the anthropometric sizing procedures used in the developement of the MBU-12/P oral-nasal oxygen mask and documents results of subsequent fit-testing and evaluation of the mask. A successor to the MBU-5/P, the MBU-12/P is designed to withstand the G and Q forces in the newer high performance aircraft as well as to provide a better fit and improved visibility. Sizing analysis and fit-testing revealed that four sizes of the MBU-12/P are sufficient to cover the USAF male flying population; the anthropometry and statistics upon which this decision was based are described in this report. Also documented here are the results of a number of ground and flight tests conducted over a period of four years which provide both objective and subjective evidence that the MBU-12/P is a well fitting mask which successfully achieves its design objectives. Subjects of all the tests were experienced aircrew whose head and face measurements were representative of a full range of the USAF flight crew population. Results of all the fit test/evaluations revealed a high degree of user acceptance and a decided preference for the MBU-12/P when compared to the older MBU-5/P. GRA

N80-14693# Armed Forces Radiobiology Research Inst., Bethesda, Md.

EARLY TRANSIENT INCAPACITATION: A REVIEW WITH

CONSIDERATION OF UNDERLYING MECHANISMS
D. O. Carpenter Apr. 1979 19 p refs
(AD-A071803; AFRRI-SR-79-1) Avail: NTIS HC A02/MF A01 CSCL 06/18

Early transient incapacitation (ETI), which is a decrement in the performance of a specified task resulting from the effects of supralethal ionizing radiation exposures, has been observed in a number of animal species. Since nuclear weapons result in radiation fields sufficient to cause ETI in personnel that may be exposed, an understanding of the mechanism of this phenomenon is essential for the development of a rational plan for preventing or reversing the effect. This report is a review of the behavioral experiments concerning ETI and presents a critical analysis of available experimental information as to the cause of the phenomenon. It appears that the primary cause of ETI in experimental animals is probably faintness resulting from a fall in cerebral blood flow due to the direct action of histamine on blood vessel smooth muscle cells. GRA

N80-14694# Naval Postgraduate School, Monterey, Calif.
A CONSIDERATION OF FACTORS CONTRIBUTING TO STRENGTH DIFFERENCES IN MEN AND WOMEN M.S. Thesis
Theodore M. Prinity Jun. 1979 80 p refs
(AD-A072671) Avail: NTIS HC A05/MF A01

The expansion of opportunities for women in today's military has increased the importance of understanding how and why men and women differ in strength, stamina, and work capacity. The present effort discusses how the different physiological/anatomical characteristics of the sexes form a basis for physical strength differences. Other factors, such as age, stature, weight, cultural influences, biomechanics, and training contribute to the significant differences in physical strength capabilities which are demonstrated both as to scope and degree. With an understanding of the strength capabilities of men and women and a comprehensive understanding of job requirements, the effective and efficient utilization of both sexes may be achieved. GRA

N80-14695# Ohio State Univ., Columbus. Dept. of Engineering Mechanics.
MEASUREMENT OF RESISTIVE TORQUES IN MAJOR HUMAN JOINTS Final Report, 1 Apr. 1976 - 30 Sep. 1978
Ali Erkan Engin Wright-Patterson AFB AMRL Apr. 1979 156 p refs
(Contracts F33615-76-C-0505; DOT-HS-6-01331; AF Proj. 2312)
(AD-A071170; AMRL-TR-79-4) Avail: NTIS HC A08/MF A01 CSCL 06/16

The major articulating joints considered are the shoulder, knee, hip, elbow and ankle. Due to drastic postmortem changes of the biomechanical response of the body tissues, the research is conducted with some obvious limitations on live human subjects. The major components of the specially designed and built experimental apparatus are a subject restraint system, a global force applicator (GFA), and an exoskeletal device (ESD). The ESD is used in monitoring the kinematics of the motion between the fixed and the moving body segments and the forces are applied to the moving body segment by means of the GFA. Design of both the ESD and GFA are similar, each containing eight high precision potentiometers. The experimental apparatus and the associated theoretical concepts are utilized to achieve at least three major tasks. These tasks are the quantitative determination of (a) the voluntary range of motion (b) the resistive force and moments and (c) the resistive torques for the rotational motion of the body segments about their long bone axes. Although the majority of the results presented are on the passive resistive force, moment and torques for the major articulating joints of three subjects, some results on the magnitudes of the active resistive muscle force, moment and torque vectors are also presented for the same subjects. GRA

N80-14696# Illinois Univ. at the Medical Center, Chicago. School of Public Health.
HEALTH EFFECTS OF AEROSOLS EMITTED FROM AN ACTIVATED SLUDGE PLANT
B. Carnow, R. Northrop, R. Wadden, S. Rosenbert, and J. Holden May 1979 232 p refs
(Grant EPA-R-805003)
(PB-299583/5; EPA-600/1-79-019) Avail: NTIS HC A11/MF A01 CSCL 06F

The health of persons residing near sewage treatment plants was studied to determine whether or not the health of persons exposed to aerosols emitted by a sewage treatment plant is significantly different from persons living in lesser exposed areas around the plant site. GRA

N80-14679# Advisory Group for Aerospace Research and Development, Paris (France).
PROBLEMS RELATED TO MEDICAL CRITERIA FOR THE SELECTION OF MILITARY NAVIGATION PERSONNEL [PROBLEMES RELATIFS AUX CRITERES MEDICAUX DE SELECTION DU PERSONNEL NAVIGANT MILITAIRE]
E. Evrard *In its* Recent Advan. in Aeron. and Space Med. Sep. 1979 22 p refs In FRENCH (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

N80-14682*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL FACTORS IN SPACE OPERATIONS. EMPHASIS ON SPACE SHUTTLE
Sam L. Pool, Paul C. Rambaut, and Jerry L. Homick *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 12 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01 CSCL 06P

N80-14683# Medical de l'Aeronautique Civile, Paris (France).
SUPERSONIC AERIAL TRANSPORT: MEDICAL AND PHYSIOLOGICAL ASPECTS [LE TRANSPORT AERIEN SUPERSONIQUE ASPECTS MEDICO-PHYSIOLOGIQUES]
Jean Raboutet *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 7 p In FRENCH (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-14697*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY INVESTIGATION OF PILOT SCANNING TECHNIQUES OF DIAL POINTING INSTRUMENTS
Randall L. Harris, Sr. Nov. 1979 22 p refs
(NASA-TM-80079) Avail: NTIS HC A02/MF A01 CSCL 05H

Two pilots' methods of looking at instruments with needle pointers in a fixed base helicopter simulation were observed. A total of 45 runs were analyzed for each pilot. The data indicated that two apparently different techniques were being used; one looking at the needle point, the other looking at a fixed spot on the instrument and reading the needle direction parafoveally. The latter technique is found to be somewhat faster with both pilots accomplishing the flying task. M.G.

N80-14698# Decisions and Designs, Inc., McLean, Va.
VALIDATION AND ERROR IN MULTIPLICATIVE UTILITY FUNCTIONS Research Report, Oct. 1977 - Dec. 1978
F. Hutton Barron Dec. 1978 52 p refs Prepared in cooperation with Univ. of Southern California
(Contract N00014-76-C-0074)
(AD-A073382; USC-001922-2-T; SSRI-RR-78-2) Avail: NTIS HC A04/MF A01 CSCL 05/10

In this report an approach to the concept of error in utility assessment is proposed. Three components of error are considered and each component is related to four separate elicitation methods-all in the context of a general multiplicative multiattribute utility model. The methods are Keeney-Raiffa (1976) procedure, SMART (Edwards, 1977), a social judgment theory (SJT) based regression model (Hammond, Stewart, Brehmer and Steinmann, 1975) and a new method called Holistic Orthogonal

Parameter Estimation or HOPE (Barron and Person, 1978). If a general multiplicative model can be assumed to be an appropriate representation of the decision maker's basic preference structure, error can occur in the direct estimation of the scaling constants and univariate utility functions for decomposition methods (Keeney-Raiffa and SMART), or in the holistic assessments for holistic methods (SJT and HOPE). Individual estimates may be merely noisy or may be fundamentally incorrect. Furthermore, the utility model may be incorrectly specified; for example, an additive model, rather than a multiplicative model, may be used. The four assessment methods are considered in conjunction with errors of each kind. Author (GRA)

N80-14699# University of Southern California, Los Angeles. Social Science Research Inst.
A CRITERION VALIDATION OF MULTIATTRIBUTE UTILITY ANALYSIS AND OF A GROUP COMMUNICATION STRATEGY Research Report, Oct. 1977 - Dec. 1978
Lee C. Ellis, III and Richard S. John Dec. 1978 53 p refs Prepared for Decisions and Designs, Inc., McLean, Va.
(Contract N00014-76-C-0074)
(AD-A073364; USC-001922-4-T; SSRI-RR-78-4) Avail: NTIS HC A04/MF A01 CSCL 05/10

This study investigates the use of an external criterion for validating additive utility assessments under certainty. Utilities were elicited from twenty-four groups via consensus judgment for ten hypothetical applicants for bank credit cards. The research design completely crossed two factors relevant to group utility assessment: (1) using a decomposition (MAUA) procedure or not, and (2) using a formal group communication strategy or not. The quality of each group's utility judgments was defined to be the Pearson produce-moment correlation between the group's judged utilities and utilities output from a configural (nonlinear) model used by Security Pacific National Bank in evaluating applicants for Master Charge. Group satisfaction measures were also obtained. The decomposition methodology and the group communication strategy both aided groups in making assessments that are more consistent with those of the bank model, which is based on a systematic collection and interpretation of a large amount of relevant data. Simplified procedures for obtaining weight parameters in the multi-attribute utility analysis yielded better overall utilities than more complicated ratio-estimation techniques. GRA

N80-14700# Decisions and Designs, Inc., McLean, Va.
IMPORTANCE WEIGHT ASSESSMENT FOR ADDITIVE, RISKLESS PREFERENCE FUNCTIONS: A REVIEW Research Report, Oct. 1977 - Dec. 1978
Richard S. John and Ward Edwards Dec. 1978 72 p refs Prepared in cooperation with Univ. of Southern California
(Contract N00014-76-C-0074)
(AD-A073365; USC-001922-5-T; SSRI-RR-78-5) Avail: NTIS HC A04/MF A01 CSCL 05/10

One of the more useful tools in decision analysis is the riskless, additive multiattribute utility (MAU) model. The most difficult task in the application of MAU models is that of estimating the importance weight parameters. Two general approaches to the weight estimation problem are extensively reviewed in the present paper: direct subjective estimation and indirect holistic estimation. Various methods for directly assessing importance weights are catalogued, including ranking, fractionation, subjective-estimate methods, and paired-comparison procedures, and their relationship to one another is discussed. The so-called indirect holistic methods, including unbiased and biased regression analyses, the ANOVA and fractional ANOVA paradigms, and the indifference techniques of pricing out and trading off to the most important dimension, are all explained with particular emphasis on their common relationship to the general linear model. Author (GRA)

N80-14701# Decisions and Designs, Inc., McLean, Va.
ARE IMPORTANT WEIGHTS SENSITIVE TO THE RANGE OF ALTERNATIVES IN MULTIATTRIBUTE UTILITY MEASUREMENT Research Report, Oct. 1977 - Dec. 1978
William F. Gabrielli, Jr. and Detlof VonWinterfeldt Dec. 1978 47 p refs Prepared in cooperation with Univ. of Southern California
(Contract N00014-76-C-0074)
(AD-A073366; USC-001922-6-T; SSRI-RR-78-6) Avail: NTIS HC A03/MF A01 CSCL 05/10

Scaling factors in multiattribute utility measurement can either be assessed directly as importance weights or indirectly by indifference judgments. Critics of the importance weight interpretation of scaling factors argue that importance weights are not sensitive to ranges of alternatives and thus cannot be used to match standardized single attribute utility functions. To examine the range sensitivity of importance weight judgments two experiments were designed. In the first experiment college students gave relative importance weight judgments for a number of attributes when evaluating apartments and liquified natural gas plant locations. After the initial importance weight assessments the range of alternatives in one attribute was changed and subjects reassessed their weights. Although subjects were explicitly instructed to take ranges into account when making these judgments, they were unable to adjust their weights appropriately. To magnify possible range effects a second experiment examined a very simple two attribute car evaluation problem. Subjects were asked directly if weights should change after the range in one attribute was doubled. Most subjects indicated that there should be no change. The results of these experiments suggest that subjects have plausible ranges in mind when assessing importance weights and that they are unwilling to change weights after relatively spurious changes in the alternative set.
Author (GRA)

N80-14702# Decisions and Designs, Inc., McLean, Va.
SUBJECTIVE VERSUS STATISTICAL IMPORTANCE WEIGHTS. A CRITERION VALIDATION Research Report, Oct. 1977 - Dec. 1978
Richard S. John and Ward Edwards Dec. 1978 52 p refs Prepared jointly with Univ. of Southern Calif., Los Angeles
(Contract N00014-76-C-0074)
(AD-A073367; SSRI-RR-78-7; USC-001922-7-T) Avail: NTIS HC A04/MF A01 CSCL 05/10

The present paper proposes a research paradigm for comparing weight estimates to empirically derived 'true' weights, thus obtaining a measure of the criterion validity of different weight estimation techniques. Subjects are first taught a multi-attribute utility (MAU) model via multiple-cue probability learning (MCPL) and outcome feedback. Then, various assessments of the importance weight parameters for the model attributes are obtained. Composites formed from these weights are subsequently compared to composites formed from optimal statistical weights derived from outcome feedback. Data are reported from 17 subjects who were taught one of three 'diamond worth' MAU models in 100 feedback trials. The models all involved four attributes (cut, color, clarity, and carat weight), and varied in the 'environmental correlations' among the dimensions (either (1) all uncorrelated, (2) one large positive correlation, or (3) two large negative correlations). The results of the present study are discussed from both an applied and theoretical perspective. To the decision analyst in the field, the present results give support to the belief that the parameter estimates obtained from clients define a 'true' normative preference function. Theoretically, the findings of this study are strong evidence that people are aware of their own cognitive processes. GRA

N80-14703# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECT OF PERIPHERALLY PRESENTED VISUAL SIGNALS ON PILOT PERFORMANCE DURING FLIGHT SIMULATION Final Technical Report, Oct. 1977 - Sep. 1978
John M. Bermudez, Jock C. H. Schwank, Thomas M. Longridge, Thomas M. McCloy, and Bruce A. Smith Jun. 1979 21 p refs
(AF Proj. 7184)
(AD-A073604; AMRL-TR-78-120) Avail: NTIS HC A02/MF A01 CSCL 05/5

Recent theoretical developments have stimulated interest in the development and testing of peripheral vision displays which could be used to monitor the control of aircraft attitude. This study investigated the ability of pilots to attend to peripherally presented attitude information via LED displays while simultaneously engaging in foveal processing of an instrument array during a complex maneuver in flight simulator. Twenty-four pilots were divided into two groups of twelve. One group performed vertical

S maneuvers using an LED display that indicated an out-of-tolerance condition in compass heading (steady LED). The second group used an LED that provided both out-of-tolerance information and rate-of-error information (strobe LED). All pilots were pre-trained to criterion. Both groups performed under each of three display conditions: Normal (standard round compass dial), Redundant (dial and LED), and Peripheral (LEDs-only). There were no statistically significant differences between the steady LED display and the strobing LED display. Overall, the results suggest that peripheral displays are at least as effective as compass dials for monitoring purposes, and such displays might prove useful as adjunct training aids with the potential for improving safety. Author (GRA)

N80-14704# Army Military Personnel Center, Alexandria, Va.
A STUDY IN PROCEDURAL MANIPULATION OF LOCUS OF CONTROL M.S. Thesis - North Carolina Central Univ. Final Report
Vernon Webster Hatley 13 Apr. 1979 72 p refs
(AD-A068658) Avail: NTIS HC A04/MF A01 CSCL 05/10

Specific locus of control change techniques were developed, examined and tested on one hundred twenty-eight (128) matched students in a general psychology class at North Carolina Central University during the spring semester of 1979. This study investigated the possibility of changing locus of control orientation in college students. Additionally, pretest locus of control scores of students who dropped the course were compared with those completing it. The experimental design was a two by four (2 x 4) matched group design. Presumed change in pretest-posttest locus of control scores as measured by Rotter's Internal External Locus of Control Scale and pretest locus of control scores of students who dropped the course were the dependent variables. Results revealed that locus of control scores in the experimental group shifted significantly (p less than .05) in the internal direction while those in the control condition moved toward an external orientation. Externals in the experimental group contributed significantly (p less than 0.5) to the overall change. Internals were found to move toward externality. The findings confirmed the contention that locus of control orientation can be influenced toward internality. Recommendations are offered for use of locus of control intervention techniques in academic settings.
Author (GRA)

N80-14705# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
EXTENDED ANALYSIS OF SMALL GROUP PERFORMANCE AND THE EFFECTS OF CONTINGENCY MANAGEMENT IN A PROGRAMMED ENVIRONMENT
H. H. Emurian and J. V. Brady 16 Apr. 1979 30 p refs
(Contract N00014-77-C-0498; NR Proj. 170-855)
(AD-A068665; TR-4) Avail: NTIS HC A03/MF A01 CSCL 05/10

Volunteer subjects have participated in a series of experimental group missions involving continuous residence for varying periods in the programmed environment. The methodology involved in these ongoing studies extends the applications of performance programming technologies detailed in prior publications. The experiments focus upon an explicit analysis of the conditions under which interrelationships between participants and experimenters influence performance effectiveness. To assess potential interrelationships between physiological status and performance effectiveness and productivity, four measures were obtained while subjects concurrently operated the performance battery: (1) heart rate, (2) frontalis EMG, (3) skin temperature, and (4) skin conductance. Urine free cortisol levels were also determined from analyses of total urine volume which was collected throughout the mission. A strong overall relationship was observed between individual productivity and mean daily urine free cortisol. These observations together suggest that the stress of sustained high productivity along with prolonged performance accuracy on a demanding task may render an individual vulnerable to disruptive emotional reactions such as those provoked by the avoidance phase of the study. Author (GRA)

N80-14708# Maryland Univ., College Park. Dept. of Psychology.
ABILITY, INVOLVEMENT AND CLIMATE AS MULTIPLE AND INTERACTIVE PREDICTORS OF PERFORMANCE
R. Gene Hoffman Apr. 1979 41 p refs
(Contract N00014-75-C-0884; RR0420402)
(AD-A068891; RR-21) Avail: NTIS HC A03/MF A01 CSCL 05/10

Student ability, involvement in the class, and classroom climate created by the instructor activities were examined as multiple and interactive predictors of course performance for 915 students in 74 sections of a mathematics course. Climate was defined in two ways: (1) as individual perceptions and (2) as shared perceptions. Two parallel analyses were conducted using the two definitions of climate. Each analysis resulted in ability, involvement and climate contributing unique variance in the prediction of student examination performance on a common exam. Climate dimensions contributing to performance were coordination of class activities, instructor skill, and the extent of critical demands (a negative relationship). The most significant difference between the two analyses was the appearance of a significant ability X coordination interaction in the analysis using shared climate perceptions. This difference was interpreted to be the result of a confounding of the interaction in the individual perceptions of coordination. The relationship between the interaction and predictive accuracy was explored. GRA

N80-14707# Maryland Univ., College Park. Dept. of Physics.
WORK PERFORMANCE AS A FUNCTION OF THE INTERACTION OF ABILITY, WORK VALUES, AND THE PERCEIVED WORK ENVIRONMENT
Robert Lee Hannon Apr. 1979 165 p refs
(Contract N00014-75-C-0884; RR0420402)
(AD-A068893; RR-22) Avail: NTIS HC A08/MF A01 CSCL 05/10

Literature pertaining to the prediction of performance from ability, motivation and their interaction was reviewed. Three personal traits (achievement motivation, locus of control, and bureaucratic values) are examined as possible antecedents of work motivation and performance. A model of work motivation that depends on the strength of the personal traits interacting with their environmental compatibility was developed. An empirical study on 417 police officers was conducted to test hypotheses generated from the models. Measures of the personal traits were developed and administered along with a questionnaire used to ascertain perceptions of the work environment. Supervisor's ratings of performance were collected as well as demographic and ability measures. Moderated multiple regression analyses found strong evidence for the performance-related validity of the work motivation model. Neither ability nor the ability-motivation interaction showed any relationship to performance. GRA

N80-14708# Maryland Univ., College Park. Dept. of Psychology.
METHODOLOGICAL AND CONCEPTUAL ISSUES IN UNDERSTANDING ABILITY-PERFORMANCE RELATIONSHIPS Final Report
Benjamin Schneider Apr. 1979 36 p refs
(Contract N00014-75-C-0884; RR0420402)
(AD-A068894; RR-25) Avail: NTIS HC A03/MF A01 CSCL 05/10

This final report presents summaries of a series of technical reports concerned with individual non-ability and contextual variables as contributions to ability-performance relationships and the prediction of work performance. Theoretical papers and laboratory and field research efforts are summarized. It was concluded that situational variables conceptualized and operationalized in a number of different ways contribute additively, but not interactively, to the prediction of performance. Also included in this report is a list of publications accomplished under this contract. GRA

N80-14709# Arizona State Univ., Tempe. Dept. of Educational Technology.
RULE LEARNING AND SYSTEMATIC INSTRUCTION IN PILOT TRAINING Final Report, 1 Oct. 1977 - 31 Dec. 1978
Vernon S. Gerlach Mar. 1979 30 p
(Grant AF-AFOSR-2900-76; AF Proj. 2313)
(AD-A068906; TD-3; AFOSR-79-0609TR) Avail: NTIS HC A03/MF A01 CSCL 05/9

Four related lines of endeavor were pursued. Central to these

activities was the research on algorithmized instruction as a form of rule learning and its effect on the acquisition of complex human behaviors. This theme was implemented in studies on the role of performance objectives in instructional systems design, on the role of self-evaluation and its relationship to performance measurement, on the use of computer models in defining algorithms involving rule-using behavior, and an observation regarding the use of the Pearson product-moment correlation in performance measurement. GRA

N80-14710# Maryland Univ., College Park. Dept. of Psychology.
RATING ERRORS OF INCONSISTENCY AS A FUNCTION OF DIMENSIONALITY OF BEHAVIORAL ANCHORS
Bruce L. Katcher and C. J. Bartlett May 1979 25 p
(Contract N00014-75-C-0884; RR0420402)
(AD-A068922; RR-24) Avail: NTIS HC A02/MF A01

The present study focuses upon rating errors of inconsistency in multidimensional behavior-specific rating scales used for purposes of performance appraisal. The hypothesis that rating scales which are more nearly unidimensional will result in a fewer rating errors of inconsistency was tested using a Mixed Standard Rating Scale developed for police supervisory personnel. Two measures of unidimensionality were used. The correlations between the indices of unidimensionality and rating inconsistency across ten rating dimensions were significant and in the predicted direction, confirming the hypothesis. The implications of the results for behaviorally anchored rating scales are discussed. GRA

N80-14711# Computer Sciences Corp., Huntsville, Ala.
A MIND/BRAIN/MATTER MODEL CONSISTENT WITH QUANTUM PHYSICS AND UFO PHENOMENA
T. E. Bearden 1979 41 p
(AD-A068988) Avail: NTIS HC A03/MF A01 CSCL 05/10

The author introduces a speculative model of mind and matter and their interaction that is consistent with the experimental basis of physics, and which offers mechanisms for paranormal phenomena of all types, including UFO phenomena. Certain conclusions are reached by a new fourth law of logic, which is briefly described and summarized. A new photon interaction model of quantized observable change is also presented. A solution to the problem of the nature of mind is generated, using the author's fourth law of logic, and a seven-dimensional hyperspatial physical model of a living biosystem is developed. Using this basic model, an infinite-dimensional cotemporal hyperspatial model of the physical universe complete with all its life forms is constructed. Levels of unconsciousness-including the collective human species unconscious--emerge naturally as types of crosstalk between hyperframes. By the author's formula, the psychokinetic power of a mind level increases exponentially as the number of biosystem stages involved. At the level of the collective human species unconscious, the psychokinesis is sufficient to materialize symbolic tulpoids (thought forms), given a sufficient stress stimulus in large groups. Using the cold war as the major stress stimulus on mankind since World War II, the author shows that most major UFO waves in the literature precisely fit the model. GRA

N80-14712# Ohio State Univ. Research Foundation, Columbus.
PROCESS MODEL OF HOW THE HUMAN OPERATOR TRACKS DISCONTINUOUS INPUTS Final Report, 1 Jul. 1977 - 30 Sep. 1978
Richard J. Jagacinski, Walter W. Johnson, E. James Hartzell, Sharon Ward, and Kaile Bishop Dec. 1978 32 p refs
(Grant AF-AFOSR-3288-77; AF Proj. 2312)
(AD-A069001; OSURF-760640/784688; AFOSR-79-0607TR)
Avail: NTIS HC A03/MF A01 CSCL 05/10

Two basic research projects were pursued. In conjunction with personnel at the 6570th Aerospace Medical Research Laboratory, Human Operator Effectiveness Branch, experiments determined that the time to acquire stationary targets with position and velocity control systems was a linear function of an Index of Difficulty measure. This measure is a logarithmic function of initial target displacement and target width. The linear relationship with capture time represents an extension of Fitts' Law, known to hold for discrete movements performed with a physical stylus. The slope of the linear relationship between capture time and the Index of Difficulty was considerably steeper for the velocity control system and was slightly steeper for greater initial target uncertainty. The second project investigated the capture of moving targets with three different control systems: (1) two independent position controls, PP; (2) two independent velocity controls, VV; and (3) one position and one velocity control, PV. The PV system yielded significantly faster capture times than the PP system. However, due to the development of two different control strategies with the VV system the difference between the VV and the other systems was not statistically significant. Further research is recommended to clarify this latter result. GRA

N80-14713# Rochester Univ., N. Y. Center for Visual Science.
A FACILITATION EFFECT IN ORIENTATION DISCRIMINATION
John Lott Brown and Iris M. Kortela 1976 29 p refs
(Contracts N00014-76-C-0189; NEI-ROI-EY-00680)
(AD-A072726; TR-76-2) Avail: NTIS HC A03/MF A01 CSCL 06/16

The minimal stimulus for orientation discrimination consists of two spots of light which define the orientation of an imaginary line. Luminance thresholds for discrimination of orientation were measured with two 5 min test spots, separated by 10, 20, 30 or 40 min of arc, located approximately 2 deg from the fovea. Test flashes were of 2 msec duration and varied in temporal relation from simultaneity to nearly 0.5 sec asynchrony. When measurements were made by an ascending method of limits with both test flashes increasing together, luminance thresholds for orientation discrimination were close to light detection thresholds and were uninfluenced by the temporal relation. When one of the flashes was presented by a constant luminance 0.6 log unit above detection threshold and the luminance of the other was the dependent variable, the luminance threshold for discrimination of orientation of the two spots varied with their temporal and spatial relations. For 30 min separation it was approximately 0.4 log unit below light detection threshold when the variable luminance spot preceded the fixed luminance spot by about 140 msecs for each of two observers. Results with haploscopic presentation suggest that the effect may represent facilitation at the cortex. GRA

N80-14681# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bonn (West Germany). Inst. fuer Flugmedizin.
THE EUROPEAN APPROACH TO THE SELECTION AND TRAINING OF SL PAYLOAD SPECIALISTS
K. E. Klein and J. R. Hordinsky *In* AGARD Recent Advan. in Aerosp. and Space Med. Sep. 1979 12 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-14714 Dutch Air Line Pilots Association, Amstelveen.
SLEEP AND BODY RHYTHM DISTURBANCE IN LONG-RANGE AVIATION. THE PROBLEM AND A SEARCH FOR RELIEF
Frank H. Hawkins Sep. 1978 98 p refs
Copyright. Avail: Issuing Activity

The effect of sleep disturbance and deprivation and body rhythm disruption in long-range aviation and on the performance of flight crews was investigated. The theory of sleep and body rhythms is presented and discussed. Human performance and sleep is also discussed. Current relief efforts are described along with possible alternative ways for relief. Some of the alternatives are autogenic training, progressive relaxation, auto-hypnosis, yoga, meditation, and biofeedback. The study concludes that for safety, social, and economic reasons, it would be advisable to research more fully the sleep problem in aviation. R.E.S.

N80-14715*# National Aeronautics and Space Administration, Washington, D. C.
TECHNOLOGIES FOR THE HANDICAPPED AND THE AGED
Trudy E. Bell Jul. 1979 48 p
(NASA-TM-80842) Avail: NTIS HC A03/MF A01 CSCL 05H

Examples of the technology transferred from advanced aerospace research projects to the needs of the handicapped and the elderly are presented. The booklet is divided into six sections, concentrating on technology respectively applied to the heart, limbs, senses, diagnostic tools, treatment and overall lifestyle. Within each section, the projects are organized roughly in chronological order, from those already completed and in the marketplace to those on the engineer's drawing board or still a concept in a physician's mind. R.E.S.

N80-14716*# National Aeronautics and Space Administration, Washington, D. C.
SIMULATION OF PHYSIOLOGICAL SYSTEMS IN ORDER TO EVALUATE AND PREDICT THE HUMAN CONDITION IN A SPACE FLIGHT
V. V. Verigo Dec. 1979 26 p refs Transl. into ENGLISH of conf. paper from Inst. of Med. and Biol. Problems, Min. of Health USSR Moscow, 1979 p 1-23 Presented at the 10th Conf. of the Joint Soviet-Am. Working Group on Space Biol. and Med., Houston, Tex., Oct. 1979
(Contract NASw-3198)
(NASA-TM-76016) Avail: NTIS HC A03/MF A01 CSCL 06S

Simulation models were used to study theoretical problems of space biology and medicine. The reaction and adaptation of the main physiological systems to the complex effects of space flight were investigated. Mathematical models were discussed in terms of their significance in the selection of the structure and design of biological life support systems. R.C.T.

N80-14717*# National Aeronautics and Space Administration, Washington, D. C.
BIOLOGICAL SYSTEMS FOR HUMAN LIFE SUPPORT: REVIEW OF THE RESEARCH IN THE USSR
Ye. Ya. Shepelev Dec. 1979 26 p refs Transl. into ENGLISH from Obzor. Issled. v SSSR, Inst. of Med. and Biol. Problems, Ministry of Health (Moscow), 1979 p 1-24 Presented at the 19th Conf. of the Joint Soviet-Am. Working Group on Space Biol. and Med., Houston, Tex., Oct. 1979 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76018) Avail: NTIS HC A03/MF A01 CSCL 06K

Various models of biological human life support systems are surveyed. Biological structures, dimensions, and functional parameters of man-chlorella-microorganism models are described. Significant observations and the results obtained from these models are reported. R.C.T.

N80-14718*# Life Systems, Inc., Cleveland, Ohio.
REGENERATIVE CO2 REMOVAL FOR PLSS APPLICATION Final Report
D. B. Heppner, R. R. Woods, and F. H. Schubert Oct. 1979 64 p refs
(Contract NAS9-15218)
(NASA-CR-160419; LSI-TR-319-31-6) Avail: NTIS HC A04/MF A01 CSCL 06K

Various concepts for the design of the nonelectrochemical absorber were defined and evaluated. A preliminary design based on the use of hollow fiber membranes was developed. Small scale bench testing demonstrated the carbon dioxide removal capability and provided design data for scale-up to the one person level. A full scale conceptual design of the absorbent regeneration hardware using six electrochemical cells was also completed. The design was supported by single cell testing and showed that a full scale regeneration system, operating continuously over 24 hours, can regenerate the absorbent from one extravehicular activity mission. The single cell regeneration hardware was operated for over 800 hours. R.E.S.

N80-14719# Systems Technology, Inc., Hawthorne, Calif.
MODELING BIODYNAMIC EFFECTS OF VIBRATION, FIFTH YEAR Final Scientific Report
Henry R. Jex and Raymond E. Magdaleno Aug. 1979 73 p refs
(Contract F44620-73-C-0075; AF Proj. 2312)
(AD-A073819; STI-1037-5; AFOSR-79-0960TR) Avail: NTIS HC A04/MF A01 CSCL 05/5

The biomechanical feedthrough of vertical and/or fore-aft vibration from a seat, to (and through) various parts of the torso, limbs, hands, and head, to a spring-restrained control stick has been modeled over a 5-year effort using prior Air Force and other data bases. This final report summarizes the project results and provides a User's Guide to BIODYN-78, an interactive, remote-access, digital computer program for exercising the model. The model involves 77 postural and physiological parameters to define a broad range of seating/control/display arrangements from supine to erect. An internal routine automatically trims the Torso/Head/Limb system at the desired angles and computes linearized equations of motion, which are solved for their eigenvalues and resulting transfer functions using highly refined computing routines. In distinction from most past models, this model represents several degrees-of-freedom simultaneously, e.g., vertical and fore/aft shoulder motion, angular head-bobbing, constrained elbow motion, stick-grip-interface force, muscle forces, and stick angular motion, among many others. GRA

N80-14720# Advanced Research Resources Organization, Washington, D.C.
METHODS FOR EVALUATING THE PHYSICAL AND EFFORT REQUIREMENTS OF NAVY TASKS: METABOLIC, PERFORMANCE, AND PHYSICAL ABILITY CORRELATES OF PERCEIVED EFFORT Technical Report, 1 May 1978 - 30 Apr. 1979
Joyce C. Hogan, George D. Ogden, Deborah L. Gebhardt, and Edwin A. Fleishman Apr. 1979 73 p refs
(Contract N00014-78-C-0430)
(AD-A072497; ARRO-3034-R79-3) Avail: NTIS HC A04/MF A01 CSCL 06/16

Two studies examined the reliability and validity of an index of perceived physical effort for assessing the metabolic and ergonomic costs of task performance. In each study, tasks whose actual performance costs were either available from work physiology literature or were calculated mathematically were rated by subjects who had no work cost information on physical effort required in the task. In the first study, subjects (N=50) completed pencil and paper ratings of tasks whose metabolic costs were known using physical ability dimensions and the index of perceived physical effort. Results indicated high correlations between metabolic costs and ratings of physical effort as well as ratings of various strength and stamina factors. In the second study, subjects (N=20) performed 24 diverse manual materials handling tasks whose ergonomic costs were calculated and rated each completed task on the index of physical effort. Results indicated a substantial relationship between actual ft-lbs. of work and ratings of physical effort. Implications of the results are discussed in terms of the inherent psychometric properties of the index and its applied utility for determining criterion performance standards and job-related training. GRA

N80-14721# Anthropology Research Project, Yellow Springs, Ohio.
DESIGN CRITERIA FOR CHARACTERIZING INDIVIDUALS IN THE EXTREME UPPER AND LOWER BODY SIZE RANGES
Kathleen Robinette and Thomas Churchill Wright-Patterson AFB, Ohio AMRL Jun. 1979 92 p refs
(Contract F33615-78-C-0508; AF Proj. 7184)
(AD-A072353; AMRL-TR-79-33) Avail: NTIS HC A05/MF A01 CSCL 06/14

Designers commonly attempt to represent a range of human body sizes by using human manikins, three-dimensional forms, computer simulations, and various other models. These analogues are developed from a limited number of body size groupings, often utilizing 5th, 50th, or 95th percentile values. There are serious limitations to this percentile approach, exemplified by the fact that at the ends of the distribution, percentile values are not additive. Focusing on the ends of the distribution,

where limitations are most intense, this report pinpoints and illustrates problems associated with the use of percentile values, and describes two alternative approaches: subgroup and regression values. Either of these alternatives offers significant improvement over the percentile approach and can be used to characterize any portion of the body size distribution. Regression equations for predicting dimensions from weight and stature and from weight and sitting height are provided to aid designers in computing dimensional body size data needed for cockpit and other work station layouts. GRA

N80-14722/ Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TIME SIMULATION OF AN AIR SURVEILLANCE TASK WITH VARYING AMOUNTS OF RADAR INFORMATION
William H. Pearson Jun. 1972 28 p refs
(AD-A074886; AMRL-TR-72-74) Avail: NTIS HC A03/MF A01 CSCL 17/7

Subjects observed a computer display unit simulating radar noise and radar trails of 150 and 500 mph aircraft, one per minute on the average, over a 1000 mile square area. Radar information was stored, cycle by cycle, up to a limit of 3,5,7 and 9 twenty second cycles and then presented sequentially rapidly enough to give an illusion of movement in the trails. Subjects detected the presence of aircraft and controlled computer processing by lightpen and keyboard actions. Time-to-detect increased with radar information for 500 mph tracks but not for 150 mph tracks. Probability of detection increased with radar information for 150 mph trails but not for 500 mph trails. These results were interpreted as showing the disruptive effect of (1) simulated radar noise confounded with the amount of radar information because of information storing and (2) the interference of the easier-to-find 500 mph aircraft with the 150 mph aircraft. GRA

N80-14723/ Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MOTOR VEHICLE MANUFACTURERS ASSOCIATION (MVMA) TWO-DIMENSIONAL CRASH VICTIM SIMULATION TUTORIAL SYSTEM: SELF-STUDY GUIDE Final Report
Bruce M. Bowman, D. Hurley Robbins, and Robert O. Bennett 28 Jun. 1979 423 p Sponsored in part by Motor Vehicle Manufacturers Assoc.
(PB-299256/8; UMICH-HSRI-79-7-1) Avail: NTIS HC A18/MF A01 CSCL 13F

A mathematical model used for predicting occupant dynamics in a crash environment is described. A self study guide divided into thirteen segments is presented. The data requirements of a set of related model features are included in each segment. Text, illustrations, and example problems are given. R.C.T.

N80-14724/ Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MOTOR VEHICLE MANUFACTURERS ASSOCIATION (MVMA) TWO-DIMENSIONAL CRASH VICTIM SIMULATION TUTORIAL SYSTEM: AUDIO-VISUAL PROGRAM Final Report
Bruce M. Bowman, D. Hurley Robbins, and Robert O. Bennett 28 Jun. 1979 303 p Prepared jointly with Motor Vehicle Manuf. Assoc. of the US
(PB-299257/6; UMICH-HSRI-79-7-2) Avail: NTIS HC A14/MF A01 CSCL 13F

A mathematical model used for predicting occupant dynamics in a crash environment is described. An audio visual program divided into thirteen segments is presented. The data requirements of a set of related model features are included in each segment. The narration text and figures used for the 35 mm slides is given. R.C.T.

N80-14725/ Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MVMA TWO-DIMENSIONAL CRASH VICTIM SIMULATION, VERSION 4, VOLUME 1 Final Report
Bruce M. Bowman, Robert O. Bennett, and D. Hurley Robbins 29 Jun. 1979 233 p refs Prepared jointly with Motor Vehicle Manuf. Assoc. of the US
(PB-299305/3; UMICH-HSRI-79-5-1-Vol-1) Avail: NTIS HC A11/MF A01; Also available in set of 3 reports HC E13, PB-299304-SET CSCL 13F

The coordinate systems describing occupant position are defined and the formulation of the equations of motion using Lagrangian techniques is detailed. The addition of forces to the equations of motion is described in general, supplemented by specific analyses for vehicle-occupant contact, gravity, joints, and restraint systems. R.C.T.

N80-14726/ Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MVMA TWO-DIMENSIONAL CRASH VICTIM SIMULATION, VERSION 4, VOLUME 2 Final Report
Bruce M. Bowman, Robert O. Bennett, and D. Hurley Robbins 29 Jun. 1979 294 p refs Prepared jointly with Motor Vehicle Manuf. Assoc. of the US
(PB-299306/1; UMICH-HSRI-79-5-2-Vol-2) Avail: NTIS HC A13/MF A01; Also available in set of 3 reports HC E13, PB-299304-SET CSCL 13F

The data required to operate the MVMA two dimensional model and program output generated using simple data sets are described. Specifications for the input data cards together with a detailed description of input data quantities are presented. Normal output options and certain normal output quantities are described. Input and output is given for two sample exercises of the computer model. GRA

N80-14727/ Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MVMA TWO-DIMENSIONAL CRASH VICTIM SIMULATION, VERSION 4, VOLUME 3 Final Report
Bruce M. Bowman, Robert O. Bennett, D. Hurley Robbins, and Judith M. Becker 29 Jun. 1979 338 p refs Prepared jointly with Motor Vehicle Manuf. Assoc. of the US
(PB-299307/9; UMICH-HSRI-79-5-3-Vol-3) Avail: NTIS HC A15/MF A01; Also available in set of 3 reports HC E13, PB-299304-SET CSCL 13F

The organization of the computer program into five processors and their interactions is presented. Description of program organization and flow, packing techniques, binary output formats, and auxiliary program output is presented for each of the five processors. Design information concerning certain special output subprocessors is provided. Conversion of the computer program for use of various computer systems is discussed. GRA

N80-14728/ Advisory Group for Aerospace Research and Development, Paris (France).
MAINTENANCE OF AIR OPERATIONS WHILE UNDER ATTACK WITH CHEMICAL AGENTS
J. Ernsting, ed. (RAF Inst. of Aviation Med., Farnborough, U.K.) Sep. 1979 51 p Presented at the Aerospace Med. Panel's Specialists' Meeting, Brussels, 22-26 Jan. 1979
(AGARD-CP-264-Suppl; ISBN-92-835-0251-5) Avail: NTIS HC A04/MF A01

The capability of NATO Forces to maintain air operations while under attack with chemical agents depends on effective personal and collective protection for the aircrew and ground personnel while allowing them to perform adequately their operational duties. Topics cover the effects and detection of chemical warfare agents as well as protection against them. For individual titles, see N80-14729 through N80-14738.

N80-14729/ Aberdeen Proving Ground, Md. Biomedical Lab.
THE EFFECTS OF ACUTE AND CHRONIC LOW DOSE EXPOSURE TO ANTICHOLINESTERASES
F. C. Cadigan and M. Chipman *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 3 p refs (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

Acute sublethal and chronic subclinical exposures to toxic anticholinesterases may result in long term neurobehavioral deficits. The deficits most likely to occur include: slowed reaction times, erratic mood swings, sleep disturbances, and impaired visual memory. Individuals who operate high performance equipment and are acutely exposed should be kept off the job until examinations of brain function are normal. Author

N80-14730# School of Aerospace Medicine, Brooks AFB, Tex.
CONSIDERATION OF PYRIDOSTIGMINE AS A PROPHYLACTIC AGENT FOR AIRCREW
B. Richardson *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 2 p refs (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

The carbamate pyridostigmine shows considerable promise as a first-generation prophylatic for nerve agent poisoning. Although it is unlikely to yield all the benefits desirable, the potential utility of pyridostigmine in conjunction with appropriate therapy warrants detailed study. Author

N80-14731# Norwegian Defence Research Establishment, Kjeller. Toxicology Div.
THE EFFECT OF LOCALLY APPLIED ORGANOPHOSPHATES ON MIOSIS AND ACETYLCHOLINESTERASE ADAPTATION TO CHRONIC TREATMENT
Didrik Malthe-Sorenssen, Nils E. Soli, and Frode Fonnum *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 5 p refs (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

Topical administration of organophosphates to the eye of guinea pigs inhibited acetylcholinesterase of different parts of the eye to a different degree. The differences reflected most likely dilution of the agent caused by diffusion into the eye. The effect of locally applied organophosphates was ascribed to an effect on the iris and ciliary muscle and not on the retina. The degree of miosis and recovery of pupillary function after soman treatment correlated better to inhibition of external acetylcholinesterase than total acetylcholinesterase. Chronic treatment with soman reduced the miotic potency of soman and reduced the recovery time of the miosis. This adaptation was dependent on other factors than cholinergic. Local treatment of miosis with topical application of oximes to the eye reduced the miosis and reactivated acetylcholinesterase in the cornea and iris. The reactivation was enhanced in the presence of benzalkonium. Author

N80-14732# Federal Armed Forces Medical Coll., Munich (West Germany). Dept. of Toxicology and Pharmacology.
THERAPY ON NERVE AGENT POISONING
Nikolaus P. Weger *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 4 p refs (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

The therapeutic properties of various combinations of the bispyridinium salts HS-3 and HS-6 and the cholinolytics atropine and benactyzine against soman poisoning were investigated in unanesthetized male beagles. Present data demonstrate that from all antidotes tested HGG-12-Cl and HGG-42-J in doses effective for treatment of men show good therapeutic effects in beagles poisoned with soman, sarin, and Vx. Best effect has HGG-42-J in a dose of 30 micron Mol/kg(~ 18.27 mg/kg). In soman poisoning no reactivation of serum cholinesterase and cholinesterase in erythrocytes was observed. Other mechanisms of therapeutic activity must be explored. A.R.H.

N80-14733# Air Force Systems Command, Wright-Patterson AFB, Ohio. Life Support System Program Office.
APPROACHES TO CW AGENT AREA DETECTION SYSTEMS FOR AIRFIELDS
Francis T. Crimmins and John J. McCambridge *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 10 p (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

United States Air Force (USAF) efforts to develop a chemical agent area detection system for the protection of air bases are examined. Point detection techniques which might provide a limited and interim area detection capability are discussed and the A/E23D-3 Chemical Agent Automatic Alarm and its characteristics are described. The USAF requirement for an instrument which will detect toxic chemical agents before they reach the intended target along with the capabilities such a detector must possess are presented. The Air Force's present views on how such a system might operate are explored. A.R.H.

N80-14734# Air Force Systems Command, Wright-Patterson AFB, Ohio. Life Support System Program Office.
PHILOSOPHY OF PROTECTION OF US AIRCREWS AGAINST CHEMICAL WARFARE AGENTS
John J. McCambridge and D. E. Root *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 2 p (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

In 1975, the USAF recognized the need to provide protective equipment to aircrews that would allow them to accomplish their operational missions after having been attacked by an enemy using chemical warfare agents. This requirement was deemed to be an urgent one; thus, a two phase program was initiated. Phase one was the development and production of near term equipment which would provide the required operational capability with delivery of equipment to the field to begin within two years. Phase two consists of a longer term program to provide more complete protection with a reduced operational burden. Author

N80-14736# Service Technique de l'Aeronautique, Paris (France).
CONCERNING INDIVIDUAL EQUIPMENT FOR FIGHTER PILOTS IN THE AIR FORCE [A PROPOS DES EQUIPEMENTS INDIVIDUELS DES PILOTES DE CHASSE DE L'ARMEE DE L'AIR]
P. H. V. Gaspa *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 3 p In FRENCH (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

In addition to the protection provided for all the armed services by way of protective suits, gloves, foot coverings, and masks for filtering particles, aircraft pilots require equipment that must be integrated with the aircraft, with parachutes, with the oxygen supply, and with survival equipment. It must meet the particular specification to provide minimal comfort needed to maintain the potential psychophysiology of the pilots, so they can accomplish their mission (which is always delicate in three dimensional space) in the midst of toxic flight factors and enemy intervention. There must be no thermal nor respiratory constraints. The design of equipment cannot impede pilot movements, the observation of parameters useful for flight, the carrying out of certain commands, nor the tactile agility of the fingers. Transl. by A.R.H.

N80-14738# Air Force Systems Command, Wright-Patterson AFB, Ohio. Life Support System Program Office.
US AIRCREW CHEMICAL DEFENSE ASSEMBLIES
Charles H. Leone and Paul F. Fallon *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 7 p (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

The current aircrew chemical defense ensemble which is divided into four subsets: eye/respiratory/head, body, hand and foot protection is described. The associated chemical agent and flight qualification testing is discussed for each piece of equipment. The status of follow on development efforts which concentrate on the aircrew chemical defense eye/respiratory/head protection is reviewed. A.R.H.

N80-14737# Bluecher G.m.b.H. Duesseldorf (West Germany).
FRG AIRCREW CHEMICAL DEFENCE ASSEMBLIES
Hubert vonBluecher *In* AGARD Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 4 p (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

Topics covered include: (1) nonbattle casualty (NBC)-protection gloves for high performance aircraft pilots; (2) SAr spherical adsorber systems; (3) the NBC-protective suit (or garment) for German propeller-aircraft pilots with emphasis on construction of the materials, life-time, and influence of water and sweat; and (4) flame-proofing for NBC-protective clothing. A.R.H.

N80-14739# Air Force Systems Command, Wright-Patterson AFB, Ohio. Life Support System Program Office.
INTEGRATION OF PROTECTION AGAINST CHEMICAL WARFARE AGENTS WITH AIRCREW PERSONAL EQUIPMENT
John J. McCambridge and Charles H. Leone *In* AGARD

Maintenance of Air Operations While Under Attack with Chem. Agents Sep. 1979 3 p (For primary document see N80-14728 05-54)
Avail: NTIS HC A04/MF A01

Protection of the aircrew member through personal equipment is a concept which assumes that such protection can not be provided in any other way. Current efforts to incorporate chemical defensive capabilities into protective equipment for the eyes, respiratory system, body, hands, and feet are described. Integration of chemical agent protection into life support systems on a superior plane would eliminate the need for providing protection through personal equipment - a shirt sleeve environment, so to speak. Such a concept would require protection of the cockpit interior at all times from the introduction of chemical agents and would require the effective filtration of influent air by the environmental control systems. A.R.H.

N80-14738# Advisory Group for Aerospace Research and Development, Paris (France).
SURVEY OF METHODS TO ASSESS WORKLOAD
Bryce O. Hartman, ed. (School of Aerospace Med.) and Richard E. McKenzie, ed. (School of Aerospace Med.) Aug. 1979 160 p refs
(AGARD-AG-246; ISBN-92-835-1332-0) Avail: NTIS HC A08/MF A01

Methods of measuring aircrew workload are reviewed. The methods reviewed include areas of systems design engineering, operations research, the behavioral sciences, aerospace medicine, physiology, biochemistry, and biotechnology in general. The measurement domains include measures of sensory threshold, measures of sensory integration, cognitive function tests, measures of motor function, vigilance, reaction time, psychophysiologic responses, and physiologic and biochemical changes. For individual titles, see N80-14740 through N80-14758.

N80-14740# Gartner (Walter B.) and Murphy (Miles R.), Menlo Park, Calif.
CONCEPTS OF WORKLOAD
Walter B. Gartner and Miles R. Murphy *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 1-2 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A summary of the attempts made to quantify the workload imposed on a pilot by a particular aircraft design or operational procedure, or to access the effects of fatigue upon system performance are discussed in regard to the more precise specification of workload and fatigue concepts and to the adequacy of assessment criteria and techniques. The principle unresolved issues in conceptualizing and measuring pilot workload and fatigue are addressed. The conception of workload is divided into three functionally related components: (1) input load, (2) operator effort, and (3) work result. A.W.H.

N80-14741# Gartner (Walter B.) and Murphy (Miles R.), Menlo Park, Calif.
CONCEPTS OF FATIGUE
Walter B. Gartner and Miles R. Murphy *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 3-5 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A survey of the concepts of pilot fatigue is reviewed. The problem in defining the concept of fatigue and dealing effectively with fatigue is discussed. Factors such as task demands or protracted effort toward fatigue are investigated. Factors such as individual differences in personality, motivation, physical fitness, and life style are considered in the investigation. A.W.H.

N80-14742# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
CONCEPTS OF STRESS
Richard E. McKenzie *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 7-9 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A survey of studies on the concept of stress from flight fatigue is presented. The physiological and psychological factors resulting from stress are examined. Relaxation as an adaptive response to stress is discussed. The use of biofeedback as an adaptive strategy for stress is studied. A.W.H.

N80-14743# Italian Air Force Medical Service H. Q., Rome.
SOME CONSIDERATIONS CONCERNING METHODS TO EVALUATE AND ASSESS WORKLOAD IN AIRCRAFT PILOTS
Gaetano Rotundo *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 11-12 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Methods for analyzing the various stressing and fatiguing factors that act on the body and psyche of aircrafts' pilots during their specific activity are examined. The variations in the urinary excretion of corticosteroids and especially catecholamine during stress and fatigue are discussed. A.W.H.

N80-14744# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
PHYSIOLOGIC ASPECTS OF WORKLOAD/FATIGUE/STRESS
Layne P. Perelli *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 13-16 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The physiological mechanisms of the aircraft pilot reacting to the effects of workload, the effects of fatigue, or the effects of stress are described. The long term physiological indicators of stress, workload and fatigue recovered from pilots and measured as urinary metabolites are examined. The cardiac activity indicators, heart rate and heart rate variability, are discussed as a tool in evaluating pilot workload. A.W.H.

N80-14745# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
SOME INSIGHTS RELATIVE TO THE MAN-MACHINE SYSTEM: AN OVERVIEW OF TEN YEARS OF RESEARCH
Richard E. McKenzie and Bryce O. Hartman *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 17-18 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The operator skills and the specific tasks involved in current operational aircraft, airborne weapons systems, and space systems are discussed in relation to pilot performance. The effects of fatigue and/or stress upon the pilot operating the systems are reviewed through past research methods. The relationship between information processing ability and aircrew performance is examined. A.W.H.

N80-14746# Virginia Polytechnic Inst. and State Univ., Blacksburg.
AIRCREW WORKLOAD ASSESSMENT TECHNIQUES
Walter W. Wierwille, Robert C. Williges, and Samuel G. Schiflett (NATC, Patuxent River, Md.) *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 19-54 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A classification scheme is presented which summarizes a survey and analysis of aircrew workload assessment techniques relevant to inflight test and evaluation considerations. Two dimensions consisting of universal operator behaviors and workload assessment methodologies were used in the classification scheme. The universal operator behaviors were classified into categories including perceptual, mediational, communication, and motor processes; whereas the workload assessment methodologies were cataloged under the general categories of subjective opinion, spare mental capacity, primary task, and physiological measures. An applicability matrix based on this classification scheme is presented which summarizes existing research on workload assessment methodologies. Procedures are described whereby this matrix is used as a guide for selecting candidate aircrew workload assessment measures for inflight evaluation. A brief overview of the various workload assessment techniques is presented along with a set of critical criteria that need to be considered in evaluating the feasibility of these measures for inflight environments. A.W.H.

N80-14747# Air Force Systems Command, Wright-Patterson AFB, Ohio. Human Engineering Div.
WORKLOAD ASSESSMENT METHODOLOGY DEVELOPMENT

Billy M. Crawford *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 55-67 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The development of a method to determine efficient crew compositions, appropriate assignments of duties and responsibilities to crew members, and effective allocations of functions and tasks among men, machines and computers is discussed. The use of the method to identify the critical periods in a task or mission during which the operator's performance is particularly prone to degradation or failure because of work overload stress is examined. Emphasis is placed on man computer interactions and information processing/decision making functions which are not adequately accounted for by conventional human performance metrics, task analysis, time and motion, and time line methods. A.W.H.

N80-14748# School of Aerospace Medicine, Brooks AFB, Tex.
QUANTITATIVE MILITARY WORKLOAD ANALYSIS
Richard A. Albanese *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 69-71 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A method of tradeoff analysis as applied to workload analysis in the military environment is discussed. It is suggested that workload studies be performed in a tradeoff setting which allows the analyst to estimate the return on investment he has earned through his proposed system modifications. The methodologies described employ mathematical modeling techniques, and it is reinforced that these techniques are an adjunct to, and not a replacement of, more traditional methods of workload analysis. K.L.

N80-14749# Army Aeromedical Research Lab., Fort Rucker, Ala.
VISUAL PERFORMANCE: A METHOD TO ASSESS WORKLOAD IN THE FLIGHT ENVIRONMENT
R. Simmons, M. Sanders, and K. Kimball *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 73-81 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

A method of assessing the workload requirements imposed on the visual system is discussed. The results suggest that the theory is a valuable tool in testing and determining what the visual workload level should be for combat proficient pilots, how long pilots with varying degrees of proficiency should be expected to fly in the combat environment, and aircraft design requirements (such as stability) to reduce the onset of fatigue-induced errors. Additionally, the theory can be utilized to test and determine varying mission related workload, as well as the workload required by special equipment such as the night vision goggles, navigation equipment, and experimental flight displays. K.L.

N80-14750# Royal Aircraft Establishment, Bedford (England).
HANDLING QUALITIES, WORKLOAD AND HEART RATE
Alan H. Roscoe *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 83-91 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Examples are given of the use of heart rates to augment pilots' opinions of handling and workload during various flight trials. It is shown that this technique gives reasonably good indications of the workload generated by particular handling qualities. Raw data in the form of beat-to-beat heart rate are invaluable for revealing rapid and short duration changes in handling qualities which affect workload. K.L.

N80-14751# Office of Naval Research, Arlington, Va.
BRAIN WAVES AND THE ENHANCEMENT OF PILOT PERFORMANCE
G. H. Lawrence *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 93-102 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Aspects of brain wave research and brain-behavior relationships that are potentially useful in simulated aircraft crew stations are discussed. A pilot performance research paradigm for studying the use of brain waves is presented. K.L.

N80-14752# California Univ. at Los Angeles. Dept. of Psychology.
PUPILLOMETRIC METHODS OF WORKLOAD EVALUATION: PRESENT STATUS AND FUTURE POSSIBILITIES
Jackson Beatty *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 103-109 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The use of pupillometric measures in the evaluation of pilot workload is discussed. The innervation of the pupil is described with respect to its connections with brainstem activation systems. Modern methods for pupillometric measurement are described and a series of experiments describing pupillary response in a variety of information processing tasks is reviewed. K.L.

N80-14753# Dunlap and Associates, Inc., La Jolla, Calif.
AIRCREW PERFORMANCE RESEARCH OPPORTUNITIES USING THE AIR COMBAT MANEUVERING RANGE (ACMR)
Clyde A. Brictson and Anthony P. Ciavarelli *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 111-113 refs (For primary document see N80-14739 05-54)
(Contract N61339-77-C-0167)
Avail: NTIS HC A08/MF A01

Three years of aircrew performance measurement using the Navy's ACMR are presented as evidence of ACMR's research potential. Performance assessment methods used to evaluate pilot proficiency are described. The aircrew assessment methods are used to identify squadron performance differences, evaluate competitive exercises, and provide diagnostic training feedback to operational users. The use of continuously recorded quantitative measures from systems such as ACMR should stimulate more aircrew performance field research ideas. The availability of objective performance criteria promises to be of substantial benefit to both the operational user and the research community in such areas as pilot selection and training, fleet combat readiness, and pilot workload and stress. K.L.

N80-14754# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
SPEECH PATTERNS AND AIRCREW WORKLOAD
R. Cannings *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 115-127 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Research into the use of speech patterns for workload analysis is reviewed in terms of a simple speech production model. The applications of analysis techniques are considered. K.L.

N80-14755# National Aviation Facilities Experimental Center, Atlantic City, N. J.
AN EXPLORATORY STUDY OF PSYCHOPHYSIOLOGICAL MEASUREMENTS AS INDICATORS OF AIR TRAFFIC CONTROL SECTOR WORKLOAD
Richard E. McKenzie, Edward P. Buckley, and Kiriako Sarlanis *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 129-133 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The possibility of relating physiological measures to some aspects of the controller's task (ie. traffic density and the occurrence of aircraft conflicts) was explored. It was found that galvanic skin response changes in the subjects were more detectable using variations in measured amplitude as compared to frequency of galvanic skin response changes. K.L.

N80-14756# National Aviation Facilities Experimental Center, Atlantic City, N. J.
INDIVIDUAL AND SYSTEM PERFORMANCE INDICES FOR THE AIR TRAFFIC CONTROL SYSTEM
Edward P. Buckley, William F. OConnor, and Tom Beebe *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 135-136 (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

The relationships between field air traffic controller perform-

ance indices and system performance measures were examined. Performance criteria developed within the controller's home facility where he controlled live traffic, and with a specially designed microsystem with simulated traffic were used. K.L.

N80-14757# Civil Aeromedical Inst., Oklahoma City, Okla. Aviation Physiology Lab.
WORKLOAD AND STRESS IN AIR TRAFFIC CONTROLLERS
Carl E. Melton *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 137-144 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Data collected at 14 air traffic control facilities regarding air traffic controller (ATCS) workload and urinary stress indicator hormone excretion is reviewed. The data show a significant relationship between objective workload measures (radio transmission time and traffic counts) and indexes of catecholamine excretion. Mean epinephrine excretion by ATCS's at six air traffic control towers, ranging from very low to very high traffic density, was significantly ($R = 0.96$) related to annual traffic counts at those towers. The sympatho-adrenomedullary axis that prepares the organism for fight or flight is applicable to ATCS's. The question of underload, optimum load, and overload is discussed. K.L.

N80-14758# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.
ASSESSMENT CORRELATES OF WORKLOAD AND PERFORMANCE
Richard E. McKenzie *In* AGARD Surv. of Methods to Assess Workload Aug. 1979 p 145-161 refs (For primary document see N80-14739 05-54)
Avail: NTIS HC A08/MF A01

Psychological, physiological, stress, and central nervous system correlates of assessment that may help in measuring and assessing human workload and performance are reviewed. Psychophysiological monitoring of central nervous function is discussed. K.L.

N80-14880# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
AN ADVANCED OXYGEN SYSTEM FOR FUTURE COMBAT AIRCRAFT
J. Ernsting *In* AGARD Recent Advan. in Aeron. and Space Med. Sep. 1979 17 p refs (For primary document see N80-14678 05-51)
Avail: NTIS HC A05/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N80-14759 Washington Univ., Seattle.
THE MEGAPROCESSOR: A MULTIPLE-PROCESSOR ARCHITECTURE BASED UPON EXPRESSION TREE PIPELINING Ph.D. Thesis
Jerry Robert Vanaken 1979 284 p
Avail: Univ. Microfilms Order No. 7927883

The basic features of a multiple processor architecture called the Megaprocessor are presented. The Megaprocessor provides a powerful numerical processing system at an inexpensive dollar cost compared to computers with similar capabilities due to the fact that the modularity of the hardware and the limited number of switching interconnections permit its major functions to be implemented using low cost, large scale integrated circuitry. The heart of the Megaprocessor is the expression tree pipeline, or X-pipe, a binary tree multiple-processor structure through which expression trees are pipelined intact. Scalar processing capability is achieved using a simple system of logical interlocks. High speed vector processing is attained through efficient static processor-scheduling algorithms and is supported by the data streaming facilities of the interface between the register space and X-pipe. Treating both scalar and vector processing tasks in similar fashion permits essentially the same hardware to be used in performing both types of computation. Dissert. Abstr.

N80-14760*# IBM Federal Systems Center, Gaithersburg, Md.
ON-BOARD MULTISPECTRAL CLASSIFICATION STUDY
D. Ewalt Dec. 1979 307 p refs
(Contract NAS1-15119)
(NASA-CR-3134) Avail: NTIS HC A14/MF A01 CSCL 09B

The factors relating to onboard multispectral classification were investigated. The functions implemented in ground-based processing systems for current Earth observation sensors were reviewed. The Multispectral Scanner, Thematic Mapper, Return Beam Vidicon, and Heat Capacity Mapper were studied. The concept of classification was reviewed and extended from the ground-based image processing functions to an onboard system capable of multispectral classification. Eight different onboard configurations, each with varying amounts of ground-spacecraft interaction, were evaluated. Each configuration was evaluated in terms of turnaround time, onboard processing and storage requirements, geometric and classification accuracy, onboard complexity, and ancillary data required from the ground. M.M.M.

N80-14761# IIT Research Inst., Chicago, Ill.
BASELINE SOFTWARE DATA SYSTEM. VOLUME 1: SYSTEM DESCRIPTION
Lorraine M. Duvall Griffiss AFB, N.Y. RADC Jul. 1979 45 p refs
(Contract F30602-77-C-0052; AF Proj. 5550)
(AD-A073358; RADC-TR-79-185-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

Volume I of this report provides a feature evaluation of the Management Data Query System (MDQS), a discussion of the contents of the Baseline databases, and a summary of the data required for software reliability modelling. Volume II is a reference guide for defining and retrieving data from the Baseline databases. GRA

N80-14762# IIT Research Inst., Chicago, Ill.
BASELINE SOFTWARE DATA SYSTEM. VOLUME 2: DATABASE REFERENCE MANUAL Final Technical Report, Feb. 1977 - Aug. 1978
Lorraine M. Duvall and Christine Curtis Griffiss AFB, N.Y. RADC Jul. 1979 89 p refs
(Contract F30602-77-C-0052; AF Proj. 5550)
(AD-A073359; RADC-TR-79-185-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

The purpose of this manual is to provide the user of the Baseline Software Data System with a general capability for retrieving information from the data bases. GRA

NSO-14763/ Naval Postgraduate School, Monterey, Calif.
ANALOG AND DIGITAL HARDWARE DEVELOPMENT FOR A MICROCOMPUTER CONTROLLED DATA ACQUISITION SYSTEM FOR ACOUSTICAL IMAGING M.S. Thesis
Reid Owen Carlock Jun. 1979 98 p refs
(AD-A074446) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis presents the design and testing of a microcomputer controlled data acquisition system for an acoustical imaging system. Analog sinusoidal signals are processed through a 256 channel analog multiplexer to high speed phase and amplitude detection channels. Analog to digital conversion is accomplished with a microcomputer peripheral module. Data storage then follows in a 64k byte peripheral memory. Interface with a cassette tape recording system is accomplished for data transferral. GRA

NSO-14764/ Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
A REGULAR LAYOUT FOR PARALLEL ADDERS Interim Report
R. P. Brent (Australian National Univ., Canberra) and H. T. Kung Jun. 1979 20 p refs
(Contract N00014-76-C-0370; Grant NSF MCS-78-236-76)
(AD-A074455; CMU-CS-79-131) Avail: NTIS HC A02/MF A01 CSCL 09/2

With VLSI architecture the chip area is a better measure of cost than the conventional gate count. We show that addition of n-bit binary numbers can be performed on a chip in time proportional to log n and with area proportional to n log n.GRA

NSO-14765/ Bendix Corp., Kansas City, Mo.
DEVELOPMENT OF A COMPARATIVE ANALYZER FOR MICROPROCESSOR
E. J. Rolfe Oct. 1978 19 p
(Contract EY-76-C-04-0613)
(BDX-613-2060-Rev) Avail: NTIS HC A02/MF A01

A method of troubleshooting a microprocessor-based product using a reference unit comparison technique was developed. This use of a comparative analyzer has significant advantages over conventional digital troubleshooting techniques. The basic concept is readily adaptable to a variety of microprocessor applications. DOE

NSO-14766/ Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
INVESTIGATION OF SECURITY CLASSIFICATIONS FOR SECURE INFORMATION FLOW
W. Storz Dec. 1978 42 p refs In GERMAN; ENGLISH summary
(Rept-275) Avail: NTIS HC A03/MF A01

A security classification system composed of security class algorithms was analyzed. It was shown that the components of each security class must guarantee a restricted information flow if a secure information flow is to be obtained. Algorithms for isolating contradictions or loopholes in security classifications are presented. A security classification which is suitable for handling data under special protection or having need-to-know status is presented. Some characteristics of this classification algorithm which bear on its implementation are summarized. Author (ESA)

NSO-14767/ Calculon Corp., Philadelphia, Pa.
COMPARISON OF HIGH SPEED PRINTER INTERFACE CHARACTERISTICS Final Report
31 Jul. 1979 144 p
(Contract NBS-8-3631)
(PB-298943/2; CALCULON-3050-R; NBS-GCR-79-182) Avail: NTIS HC A07/MF A01 CSCL 09B

The high speed printers considered are placed into three general types according to their arrangement of hammer drive signals, i.e., those with individual hammer drive signals, those with coded hammer address signals, and those which include a line buffer and control electronics within the printer and therefore accept coded data signals representing successive characters in the line to be printed. Among each of these three types of printers, only the third type exhibits significant commonality of interface among the various printers and suppliers. GRA

NSO-14020/ Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
TRENDS IN DIGITAL DATA PROCESSING AND SYSTEM ARCHITECTURE
A. A. Calloway *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 5 p (For primary document see NSO-14017 05-01)
Avail: NTIS HC A16/MF A01

NSO-14021/ Societe Crouzet, Valence (France).
A METHOD FOR DESIGNING MULTIPROCESSOR ARCHITECTURES FOR AVIONICS FUNCTIONS [METHODOLOGIE DE CONCEPTION D'ARCHITECTURES MULTI-PROCESSEURS POUR DES FONCTIONS D'AVIONIQUE]
C. Aleonard, A. Demoment, P. Romand, J. Gillon (CERT, Toulouse, France), and J. F. LeMaitre (CERT, Toulouse, France) *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 7 p In FRENCH (For primary document see NSO-14017 05-01)
Avail: NTIS HC A16/MF A01

NSO-14041/ Societe d'Applications Generales d'Electricite et de Mecanique, Paris (France).
COPRA: A NEW LINE OF ULTRARELIABLE RECONFIGURABLE COMPUTERS DESTINED FOR ONBOARD AEROSPACE APPLICATIONS [COPRA: UNE LIGNE NOUVELLE DECALCULAETEURS RECONFIGURABLES ULTRA-FIABLES DESTINEE AUX APPLICATIONS AEROSPATIALES EMBARQUEES]
C. Meraud and F. Browaeys *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 23 p In FRENCH (For primary document see NSO-14017 05-01)
Avail: NTIS HC A16/MF A01

NSO-14182*/ Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE MICROPROCESSOR-BASED SYNTHESIZER CONTROLLER
H. Donnelly, M. R. Wick, R. W. Weller, G. B. Schaaf, B. Barber, and M. A. Stern *In its* The Deep Space Network 15 Dec. 1979 p 92-103 refs (For primary document see NSO-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

NSO-14768 Vanderbilt Univ., Nashville, Tenn.
A MICROPROCESSOR-BASED RANDOM-DOT STEREOGRAM SYSTEM Ph.D. Thesis
Sudhakar Sooda Shetty 1979 144 p
Avail: Univ. Microfilms Order No. 7926627

A stereogram uniquely suited for investigation of binocular vision and stereopsis is presented. The system for stereogram generation has several advantages over earlier methods and is well suited both for basic research and clinical testing. The system consists of three major sections: 1) the display unit; 2) the microprocessor unit; and 3) the interface unit. The system was used for the investigation of visually evoked cortical potentials. The experiments revealed the neural activity correlated with the processing of the stereoscopic stimulus. Further, the latencies of the potential confirmed the earlier reports indicating that perception of global stereopsis requires more time than does physically defined stimuli. Dissert. Abstr.

NSO-14769 Northwestern Univ., Evanston, Ill.
ANALYSIS OF LOGICAL RIPPLE EFFECT OF PROGRAM MODIFICATION Ph.D. Thesis
Terry Ellis MacGregor 1979 271 p
Avail: Univ. Microfilms Order No. 7927398

A tool is presented which identifies program areas which require additional maintenance activity to ensure their logical consistency with an initial change. Identification is done using a

ripple effect analysis technique to statically characterize the program with respect to the proposed modification. Following characterization, the maintenance practitioner identifies program areas undergoing change to define a starting point for an algorithm to compute ripple effect. An intramodule error flow model emulates error flow within a module and an intermodule error flow model emulates error flow between modules. Both models work in a complementary fashion to emulate error flow within the software system. In addition to aiding the maintenance practitioner in making program modifications, the tool computes a measure of the effect that the modification has on the overall program structure, and an estimate of the work required to implement the change and accommodate ripple effect. Dissert. Abstr.

N80-14770 Southern Methodist Univ., Dallas, Tex.
RESTORATION AND ENHANCEMENT OF IMAGES OBSERVED IN MULTIPLICATIVE NOISE Ph.D. Thesis
Daryl Otis Lee 1979 67 p
Avail: Univ. Microfilms Order No. 7926665

Digital computer technology was applied to image processing particularly the restoration and enhancement of noise corrupted images. Algorithms that provide restoration and enhancement for images with a multiplicative noise model are presented. Examples and significant results are reported. Dissert. Abstr.

N80-14771*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTATIONAL METHODS FOR ANALYZING THE TRANSMISSION CHARACTERISTICS OF A BETA PARTICLE MAGNETIC ANALYSIS SYSTEM
Jag J. Singh Dec. 1979 53 p
(NASA-TM-80179; L-13345) Avail: NTIS HC A04/MF A01 CSCL 09B

Computational methods were developed to study the trajectories of beta particles (positrons) through a magnetic analysis system as a function of the spatial distribution of the radionuclides in the beta source, size and shape of the source collimator, and the strength of the analyzer magnetic field. On the basis of these methods, the particle flux, their energy spectrum, and source-to-target transit times have been calculated for Na-22 positrons as a function of the analyzer magnetic field and the size and location of the target. These data are in studies requiring parallel beams of positrons of uniform energy such as measurement of the moisture distribution in composite materials. Computer programs for obtaining various trajectories are included. A.R.H.

N80-14772*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
CLUSTERING ALGORITHM EVALUATION AND THE DEVELOPMENT OF A REPLACEMENT FOR PROCEDURE 1
R. K. Lennington and J. K. Johnson Nov. 1979 80 p refs
(Contract NAS9-15800)
(NASA-CR-160424; LEC-13945; JSC-16232) Avail: NTIS HC A05/MF A01 CSCL 09B

An efficient procedure which clusters data using a completely unsupervised clustering algorithm and then uses labeled pixels to label the resulting clusters or perform a stratified estimate using the clusters as strata is developed. Three clustering algorithms, CLASSY, AMOEBA, and ISOCLS, are compared for efficiency. Three stratified estimation schemes and three labeling schemes are also considered and compared. K.L.

N80-14773*# Boeing Commercial Airplane Co., Seattle, Wash.
FORTRAN SUBROUTINES FOR OUT-OF-CORE SOLUTIONS OF LARGE COMPLEX LINEAR SYSTEMS Final Report
Elizabeth L. Yip Nov. 1979 42 p refs
(Contract NAS1-15128)
(NASA-CR-159142; BCS-40283) Avail: NTIS HC A03/MF A01 CSCL 09B

The design and usage of two main subprograms using direct methods to solve large linear complex systems, of the form $Ax = b$, whose coefficient matrices are too large to be stored in core are described. The first main subprogram is for systems whose coefficient matrices are of a particular sparse structure, namely, the matrix A can be written in the form $B + D$, where B is a block-banded system, and D has only a few columns of nonzeros. Key elements of the algorithms used in the subprograms include: the data structure, the strategy for preserving numerical stability, the adaptability of the algorithms for dense systems as well as for block-profile systems. M.M.M.

N80-14774# Yale Univ., New Haven, Conn Dept. of Computer Science.
KNOWLEDGE-BASED PARSING Ph.D. Thesis
Anatole V. Gershman Apr. 1979 179 p refs
(Contract N00014-75-C-1111)
(AD-A068666; RR-156) Avail: NTIS HC A09/MF A01 CSCL 05/7

A model for knowledge-based natural language analysis is described. The model is applied to parsing English into Conceptual Dependency representations. The model processes sentences from left to right, one word at a time, using linguistic and non-linguistic knowledge to find the meaning of the input. It operates in three modes: structure-driven, position-driven, and situation-driven. The first two modes are expectation-based. In structure driven mode concepts underlying new input are expected to fill slots in the previously built conceptual structures. Noun groups are handled in position-driven mode which uses position-based pooling of expectations. When the first two modes fail to account for a new input, the parser goes into the third, situation-driven mode which tries to handle a situation by applying a series of appropriate experts. Four general kinds of knowledge are identified as necessary for language understanding: lexical knowledge, world knowledge, linguistic knowledge, and contextual knowledge. GRA

N80-14775# Amherst Systems, Inc., Buffalo, N.Y.
IMAGE PROCESSING SYSTEM SOFTWARE. VOLUME 1: USERS MANUAL Final Technical Report, Feb. - Nov. 1978
Edward G. Eberl and Philip T. Glinski Griffiss AFB, N.Y. RADC Jun. 1979 146 p 2 Vol.
(Contract F30602-78-C-0077; AF Proj. 6244)
(AD-A073652; AMHERST-0077-Vol-1; RADC-TR-79-52-Vol-1)
Avail: NTIS HC A07/MF A01 CSCL 09/2

This document is the final report describing the effort by Amherst Systems, Inc. to convert a portion of the RADC image processing software to RSX-11M to allow execution on DEC PDP 11/45 computer located at WPAFB OH, AFAL. A section of this report is written in the form of a user's manual for personnel engaged in the operation of converted software. A companion document is the programmer's manual which describes the new material incorporated into the system. GRA

N80-14776# Amherst Systems, Inc., Buffalo, N.Y.
IMAGE PROCESSING SYSTEM SOFTWARE. VOLUME 2: PROGRAMMING MANUAL Final Technical Report, Feb. - Nov. 1978
Edward G. Eberl and Philip T. Glinski Griffiss AFB, N.Y. RADC Jun. 1979 215 p 2 Vol.
(Contract F30602-78-C-0077; AF Proj. 6244)
(AD-A073653; AMHERST-0077-Vol-2; RADC-TR-79-52-Vol-2)
Avail: NTIS HC A10/MF A01 CSCL 09/2

Contents: Software System Design; Programmer's Manual; FORTRAN 4-Plus Interface; and Program Descriptions. GRA

N80-14777# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
A COMPUTER PROGRAM FOR ESTIMATION OF PARAMETERS OF THE WEIBULL INTENSITY FUNCTION AND FOR THE CRAMER-VON MISES GOODNESS OF FIT TEST
Edward F. Belbot Jul. 1979 68 p refs
(DA Proj. 1R7-65706-M-541)
(AD-A074764; AMSAA-TR-279) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes the structure and use of a digital computer program written in Standard FORTRAN, which can be used to obtain the maximum likelihood estimates of the parameters of the Weibull intensity function. The program also performs the Cramer-Von Mises goodness of fit test. GRA

N80-14778# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
A SYSTEMATIC METHODOLOGY FOR DESIGNING THE ARCHITECTURE OF COMPLEX SOFTWARE SYSTEMS

S. L. Huff and S. E. Madnick Sep. 1979 609 p refs
(Grant N00039-78-G-0160)
(AD-A074911; CISR-P010-7906-12; CISR-TR-12) Avail: NTIS HC A99/MF A01 CSCL 09/2

Designers of complex software systems, finding the scope of the problem beyond their cognitive abilities to grasp all at once, often attempt to cope by decomposing the original design problem into more manageable sub-problems. In software design, this decomposition is usually carried out in an ad hoc, intuitive fashion by the system architect. Software research has shown that poor decisions during this preliminary design state can lead to serious problems, difficult to correct during later stages of the system development cycle. The aim of the present research is to help develop a new software design method--the Systematic Design Methodology, or SDM. SDM is intended to aid the software architect in carrying out preliminary design activities, and in synthesizing a design problem structure for the system under consideration. Using SDM involves developing a graph model of a system's functional requirements and their implementation interdependencies, then decomposing the graph using heuristic techniques such as cluster analysis or graph partitioning algorithms. A quantified objective function possessing high strength, with low coupling between subproblems, is used to locate the best graph decomposition. GRA

N80-14779# RAND Corp., Santa Monica, Calif.
A NETWORK GRAPHICAL CONFERENCING SYSTEM Interim Report
M. T. OBrien Aug. 1979 32 p refs
(Contract MDA903-78-C-0029; ARPA Order 3460)
(AD-A074610; RAND/N-1250-ARPA) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes design goals for a network-oriented, color graphical conferencing system designed to allow several people to confer simultaneously over a network. Users share a common display, divided into individual 'windows' for each user, and a common graphical 'blackboard' window where users sketch and modify a full-color display. The display uses bit-map color raster-scan technology. Each user's window is identified with his name and location. Text appears in the window as it is typed. Several users may type text simultaneously. A special identifying symbol appears in the window of a user who is sketching. Several simultaneous conferences can be accommodated; users may request a display showing who is participating in which conferences. Conferences may be 'locked' to prevent others from joining. GRA

N80-14780# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
TWO FORTRAN PROGRAMS FOR THE COMPUTATION OF THE MEAN BEAM PATTERN OF A PERTURBED ARRAY
F. Dommermuth Nov. 1978 40 p refs In GERMAN; ENGLISH summary
(Contract BMVG-T/RF-37/71501/71300)
Avail: NTIS HC A03/MF A01

Two FORTRAN programs which perform the computation of the mean beam pattern of a sinusoidally perturbed towed array with respect to a signal having a Gaussian spectrum are presented. A mathematical expression for calculating the mean pattern, in the case of normally distributed array perturbations, is derived. Author (ESA)

N80-14781# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Inst. fuer Mathematik.
MODULAR PROGRAMS FOR THE FAST SOLVING OF LINEAR ELLIPTIC EQUATIONS BY REDUCTION METHODS: TR2D01, TR2D02 TO SOLVE THE DIRICHLET PROBLEM FOR HELMHOLTZ EQUATION; USER'S MANUAL CONCERNING THE CLUB MODULEF
Hartmut Foerster 1978 27 p refs
(GMD-Mitt-47) Avail: NTIS HC A03/MF A01

The modular programs TR2D01 and TR2D02 are described. Both modules can be used to solve the Helmholtz equation of a rectangle with Dirichlet's boundary conditions where the given problem is approximated by a system of linear equations. To this system the method of total reduction by Schroder and Trottenberg is applied. The data structure out is generated to contain the solution of the discrete boundary value problem. The difference between module TR2D01 and module TR2D02 lies in the discretization. Making use of a five point formula gives order 2 in TR2D01, while a nine point formula yields order 4 in TR2D02. This manual is a modified version of a preprint. The modifications concern the terminology and the programming conventions of the Club MODULEF (IRIA/LABORIA, Paris). These conventions, especially the program and data structures, are supposed to be known. Author (ESA)

N80-14782# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
ANALYTIC TECHNIQUES FOR PROCESSING SIGNAL AND NOISE THROUGH A NONLINEAR CHANNEL USING MODSIM. VOLUME 2: MODSIM SOFTWARE DESCRIPTION
S. G. Brazier and B. G. West Dec. 1977 112 p refs 3 Vol.
(Contract ESTEC-2327/74-hp)
(ESA-CR(P)-878-Vol-2) Avail: NTIS HC A06/MF A01

A description of the computer program implementation of an analytic technique is presented, which was developed to study the behavior of a signal in a noisy nonlinear channel. Greater economy in the running of the simulation program MODSIM can be achieved by using analytical techniques to account for the effect of noise instead of performing multiple runs with different noise samples where it is difficult to assess the confidence limits. Three mathematical techniques were studied which can be used to perform the analysis. The method most applicable uses a polynomial expansion of the nonlinear device characteristics. The noise after the nonlinear device is characterized by its autocorrelation function. For volumes 1 and 3 see ESA 93206 and 93208. Author (ESA)

N80-14783# Marconi Co. Ltd., Chelmsford (England). Mathematical Physics and Circuitry Group.
ANALYTIC TECHNIQUES FOR PROCESSING SIGNAL AND NOISE THROUGH A NONLINEAR CHANNEL USING MODSIM. VOLUME 3: CURVE FITTING SOFTWARE DESCRIPTION
S. G. Brazier Dec. 1977 109 p refs 3 Vol.
(Contract ESTEC-2327/74-hp)
(ESA-CR(P)-878-Vol-3) Avail: NTIS HC A06/MF A01

The curve fitting software implementation of the analytic techniques developed for processing signal plus noise in a nonlinear channel is described. The method which provides an economic alternative to the Monte Carlo methods used in simulation programs such as MODSIM is described. The program fits either a polynomial or a series of Bessel functions to a set of data defining the complex voltage transfer characteristics of a device. FORTRAN 4 language was used in an ICL 4/70 computer. Author (ESA)

N80-14784# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
ANALYTIC TECHNIQUES FOR PROCESSING SIGNAL AND NOISE THROUGH A NON-LINEAR CHANNEL USING MODSIM. VOLUME 1: ANALYSIS METHODS AND PRELIMINARY RESULTS
G. A. Richards, S. G. Brazier, and P. G. Wright Dec. 1977 135 p refs 3 Vol.
(Contract ESTEC-2327/74-hp)
(ESA-CR(P)-1228-Vol-1) Avail: NTIS HC A07/MF A01

The analytic techniques that have been developed for processing signal plus noise in a nonlinear channel are described. The purpose is to provide an economical alternative to the Monte-Carlo methods used in simulation programs such as MODSIM. Channels are considered which consist of a filter followed by a memoryless nonlinear device and then a further filter. A program was developed to generate the moments of the noise at the output of the nonlinear device. The method for further processing is to approximate the noise probability density function by a weighted sum of gaussian density functions. The joint density function in time is obtained by matching the noise moments to the second order properties of the noise. Processing through the second filter is then achieved using characteristic functions. The initial results show that unless there is a low signal to noise ratio, the performance of these methods is adequate. A Monte Carlo simulation was also carried out and

the resulting histograms show reasonable agreement with the described methods. Author (ESA)

N80-14785# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
SUPPLEMENT TO: ANALYTIC TECHNIQUES FOR PROCESSING SIGNAL AND NOISE THROUGH A NONLINEAR CHANNEL USING MODSIM. VOLUME 2: MOMENT SOFTWARE DESCRIPTION
S. G. Brazier and P. G. Wright Dec. 1977 60 p refs 3 Vol.
(Contract ESTEC-1327/74-hp-Rider-1)
(ESA-CR(P)-1228-Vol-2) Avail: NTIS HC A04/MF A01

The moment software implementing the analytic techniques that were developed for processing signal plus noise in a non-linear channel is described. The purpose of the method is to provide an economical alternative to the Monte-Carlo methods used in simulation programs such as MODSIM. Channels are considered which consist of a filter followed by a memoryless non-linear device and then a further filter. A program was developed to generate the moments of the noise at the output of the non-linear device. The noise probability density function is approximated by a weighted sum of Gaussian density functions. The joint density function in time is obtained by matching the noise moments to the second order properties of the noise. Processing through the second filter is then achieved using characteristics functions. Author (ESA)

N80-14786# Marconi Co. Ltd., Chelmsford (England). Theoretical Support Services.
ANALYTIC TECHNIQUES FOR PROCESSING SIGNAL AND NOISE THROUGH A NONLINEAR CHANNEL USING MODSIM. VOLUME 3: GENERAL THEORETICAL TECHNIQUES
L. M. McLaughlin 1977 245 p refs 3 Vol.
(Contract ESTEC-2327/74-hp)
(ESA-CR(P)-1228-Vol-3) Avail: NTIS HC A11/MF A01

The general theoretical techniques used to develop the analytic techniques used for processing signal plus noise in a non-linear channel are described. The purpose is to provide an economical alternative to the Monte-Carlo methods used in simulation programs such as MODSIM. Channels are considered which consist of a filter by a memoryless nonlinear device and then a further filter. A program was developed to generate the moments of the noise at the output of the non-linear device. The noise probability density function is approximated by a weighted sum of gaussian density functions. The joint density function in time is obtained by matching the noise moments to the second order properties of the noise. Processing through the second filter is then achieved using characteristics functions. Author (ESA)

N80-14787# European Space Agency, Paris (France).
A SIMPLE PROCEDURE FOR SIMULATION OF HOMOGENEOUS MARKHOV CHAINS ON A COMPUTER
Theodor Dahlem Mar. 1979 48 p refs Transl. into ENGLISH of 'Ein einfaches Verfahren zur Simulation homogener Markoffscher Ketten auf einem elektronischen Rechner', DFVLR, Oberpfaffenhofen, West Ger. Report DLR-FB-77-66, Mar. 1978 Original German report available from DFVLR, Cologne DM 17,70
(ESA-TT-529; DLR-FB-77-66) Avail: NTIS HC A03/MF A01

The simulation of a sample set of a homogeneous Markov chain with a finite number of states using a sequence of uniform pseudo random numbers generated on a computer is described. The probability distributions corresponding to the row vectors of the transition matrix of the Markov chain are used to transform the set to a new sequence of random numbers. These are values of a member function of the stochastic process to be simulated. Two examples are presented. Author (ESA)

N80-14788# European Space Agency, Paris (France).
'PROCOPES'. (CONVERSATIONAL PROGRAM FOR SIGNAL ANALYSIS): EVOLVEMENT OF AN INTERPRETATIVE CONTROL LANGUAGE Ph.D. Thesis - Univ. de Paris-Sud.
Jean-Paul Boisseau Oct. 1979 170 p refs Transl. into ENGLISH of 'PROCOPES'. (Programme Conversationnel pour l'Etude du Signal): Evolution vers un Langage de Commande Interpretatif', ONERA, Paris Report ONERA-NT-1978-8, 6 Sep. 1978 Original report in FRENCH previously announced as N79-32883
(ESA-TT-581; ONERA-NT-1978-8) Avail: NTIS HC A08/MF A01

Results of work with a computer piloted signal processing system are reported. The complexity of the analysis instrumentation, the diversity of processing requested by the users, and the orientation toward self-service showed the necessity of implementing an evolutive, conversational system with a simple command language which, at the same time, optimizes the use of the computer central unit. The first version of PROCOPES, has been operational since 1974 and, since then, its evolution has been partly guided by the remarks or needs of users. The study of a more sophisticated command language is presented. The work was carried out, on now obsolescent hardware, within the framework of signal processing based on digitization, a processing method that has become generalized with the appearance of new hardware, such as Array Processors associated with minicomputers of the new generation. Two examples of the use of this command language are presented. The interest of integrating this type into present-day hardware is discussed. Author (ESA)

N80-14789# European Space Agency, Paris (France).
RAY TRACING AND APPLICATION OF THE GEOMETRICAL THEORY OF DIFFRACTION FOR CALCULATING THE SCATTERED FIELDS OF COMPLICATED STRUCTURES
A. Schrott May 1979 81 p refs Transl. into ENGLISH of 'Konstruktion der Strahlenwege und Anwendung der geometrischen Beugungstheorie zur Berechnung von Streufeldern komplizierter Koerper', DFVLR, Oberpfaffenhofen, West Ger. Report DFVLR-FB-78-19, 18 Oct. 1978 Original German report available from DFVLR, Cologne DM 28,90
(ESA-TT-595; DFVLR-FB-78-19) Avail: NTIS HC A05/MF A01

For important basic structures of satellites and aircraft, such as polyhedral convex bodies and circular or elliptical cylinders, the ray tracing is treated in detail. Ray tracing for composite structures is described for the example of an aircraft which is approximated by an elliptical cylinder with flat plates as wings. The programs used for the computation of antennas on complicated structures are discussed. The field of application and the accuracy of the geometrical theory of diffraction is demonstrated with numerous computed examples. Author (ESA)

N80-14790# European Space Agency, Paris (France).
COMPUTATION OF THE ELECTRODYNAMIC BEHAVIOR OF COMPLICATED STRUCTURES BY MEANS OF THE INTEGRAL EQUATION METHOD
Volker Stein May 1979 55 p refs Transl. into ENGLISH of 'Berechnung der elektrodynamischen Eigenschaften komplizierter Strukturen mit Hilfe der Integralgleichungsmethode - Anwendungsbeispiele' Original German report available from DFVLR, Cologne DM 20,70
(ESA-TT-598; DFVLR-FB-78-18) Avail: NTIS HC A04/MF A01

The computer programs based on the integral equation method are briefly described. Using these programs numerous examples are computed, in order to demonstrate the wide field of application of the integral equation method. The accuracy of the method is determined by comparing the computed values with experimental results or with the results of other methods. Author (ESA)

N80-14039*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SIMULATION USE IN THE DEVELOPMENT AND VALIDATION OF HIMAT FLIGHT SOFTWARE
Albert Myers *In* AGARD Advan. in Guidance and Control Systems Using Digital Tech. Aug. 1979 12 p refs (For primary document see N80-14017 05-01)
Avail: NTIS HC A16/MF A01 CSCL 09B

N80-14161*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN EFFICIENT PROGRAM FOR DECODING THE (255,223) REED-SOLOMON CODE OVER GF (2 TO THE 8TH POWER) WITH BOTH ERRORS AND ERASURES, USING TRANSFORM DECODING
R. L. Miller, T. K. Truong, and I. S. Reed (Univ. of Southern

California) *In its* The Deep Space Network 15 Dec. 1979 p 82-91 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N80-14791*# Illinois Univ. at Urbana-Champaign. Dept. of Computer Science.
A PROJECT TO INVESTIGATE MECHANISMS AND METHODOLOGIES FOR THE DESIGN AND CONSTRUCTION OF COMMUNICATING CONCURRENT PROCESSES IN REAL-TIME ENVIRONMENTS Yearly Report, 1979
R. H. Campbell and K. Horton 21 Dec. 1979 55 p refs
(Grant NsG-1471)
(NASA-CR-162557; UIUCDCS-R-79-998) Avail: NTIS HC A04/MF A01 CSCL 09B

Research undertaken in 1979 into effective and appropriate mechanisms to aid in the design and construction of software for use in the flight research programs undertaken by NASA is presented. M.M.M.

N80-14792# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
BOOTSTRAPPING FOR A BCPL COMPILER
J. vonderDecken and N. Hask Aug. 1978 45 p refs In GERMAN; ENGLISH summary
(Rept-271) Avail: NTIS HC A03/MF A01

The implementation of a basic combined programming language (BCPL) compiler on a Siemens 4004/150 computer is treated. An ALGOL-type language (BCPL) based on CPL was developed in the middle sixties. The BCPL compiler, which is written in BCPL, is a highly portable program which has been successfully applied to a number of different systems. An interpreter, a code generator, and a BCPL interface routine were written for the BCPL compiler construction, the software of which are presented and studied. Author (ESA)

N80-14793# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
A COMMUNICATION PROBLEM IN A COMPUTER NETWORK
G. Buehler Aug. 1978 27 p refs In GERMAN; ENGLISH summary
(Rept-272) Avail: NTIS HC A03/MF A01

A special problem of synchronization of independent processes in a computer network is considered. In the solution described the network keeps working despite the failure of any individual component. Data routing is discussed and remote job entry protocol is outlined for the system hypothesized. Solutions for input/output problems on different protocol levels are given and the associated software is presented. Author (ESA)

N80-14794# Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
A COST OPTIMAL SOLUTION FOR DEADLOCKED PROCESSES
Wolfgang Schulze Sep. 1978 28 p refs In GERMAN; ENGLISH summary
(Rept-273) Avail: NTIS HC A03/MF A01

The cheapest process combination for removing deadlocks from a system of deadlocked processes with given backup cost is discussed. A method is presented which finds a minimum cut in a graph with node values after detecting the deadlock and after the elimination of redundant processes by evaluation of maximum flow. Estimates of the run times for single subtasks show that the method is applicable in practice. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N80-14795 Northwestern Univ., Evanston, Ill.
SIMULATION AND REAL-TIME SYSTEM DESIGN: AN INTEGRATED APPROACH Ph.D. Thesis
Sandra Lynn Ward 1979 162 p
Avail: Univ. Microfilms Order No. 7927475

A methodology for incorporating system simulation into the development cycle for real time, process control systems was investigated. A formalism to compare the simulations so arising to their real time counterparts is developed. An implementation for an existing real time environment is discussed. Experimental results are presented which demonstrate the strength of the approach in predicting real time performance. Dissert. Abstr.

N80-14796# Dynamic Systems, Urbana, Ill.
WORKSHOP ON ADAPTIVE CONTROL Final Report
J. B. Cruz, Jr. 15 Jul. 1979 204 p Workshop held at Champaign, Ill., 8-10 May 1979
(Contract F49620-79-C-0056; AF Proj. 2304)
(AD-A072723; R79-1; AFOSR-79-0911TR) Avail: NTIS HC A10/MF A01 CSCL 09/2

A workshop on Adaptive Control, with thirty four participants, examined the status of the field, discussed potential applications, and agreed on directions for future research. Three working groups were formed, one on robust control, one on model reference adaptive control and self-tuning regulators, and one on stochastic adaptive control. Areas were identified where concepts from robust control would combine with those from active adaptive control to provide a powerful approach. Numerous suggestions for future research were generated. GRA

N80-14797# Stanford Univ., Calif. Dept. of Computer Science.
SEARCH. A SECTION OF THE HANDBOOK OF ARTIFICIAL INTELLIGENCE
Anne Gardner Jun. 1979 113 p refs
(Contracts MDA903-77-C-0322; NIH-RR-00785-06; ARPA Order 3423)
(AD-A074078; SU-STAN-CS-79-742; HPP-79-12) Avail: NTIS HC A06/MF A01 CSCL 06/4

In the handbook we intend to cover the breadth and depth of AI, presenting general overviews of the scientific issues, as well as detailed discussions of particular techniques and important AI systems. Throughout we have tried to keep in mind the reader who is not a specialist in AI. As the cost of computation continues to fall, new areas of application of computers become potentially viable. For many of these areas, there do not exist mathematical 'cores' to structure calculational use of the computer. Such areas will inevitably be served by symbolic models and symbolic inference techniques. Yet those who understand symbolic computation have been speaking largely to themselves for twenty years. We feel that it is urgent for AI to 'go public' in the manner intended by the handbook. Several other writers have recognized a need for more widespread knowledge of AI and have attempted to help fill the vacuum. Lay reviews, in particular Margaret Boden's Artificial Intelligence and Natural Man, have tried to explain what is important and interesting about AI, and how research in AI progresses through our programs. In addition, there are a few textbooks that attempt to present a more detailed view of selected areas of AI, for the serious student of computer science. But no textbook can hope to describe all of the sub-areas, present brief explanations of the important ideas and techniques, and review the 40 or 50 most important AI systems. GRA

N80-14798# Stanford Linear Accelerator Center, Calif.
MICROCOMPUTER-BASED MONITORING AND CONTROL SYSTEM
D. Talaska Mar. 1979 13 p refs
(Contract EY-76-C-03-0515)
(SLAC-TN-79-3) Avail: NTIS HC A02/MF A01

A version of the control system presented is operating at

the one meter liquid hydrogen bubble chamber augmenting the conventional pneumatic and human feedback system. Its use has greatly improved the controlled tolerances of temperature and pulse shape, and it has nearly eliminated the need for operating personnel to adjust the conventional pneumatic control system. The latter is most important since the rapid cycling machine can demand attentions beyond the operator's skill. Similar microcomputer systems are being prepared to monitor and control cryogenic devices situated in regions of radiation which preclude human entry and at diverse locations which defy the dexterity of the few operators assigned to maintain them. An IMSAI 8080 microcomputer is basic to the system. The development of unique interface circuitry is reported. DOE

N80-14799# Technische Universitaet, Brunswick (West Germany). Inst. fuer Angewandte Mathematik.
THE DECOMPOSITION OF MIXTURES AND CLASSIFICATION USING THE GRADIENT TECHNIQUE [DEKOMPOSITION VON MISCHUNGEN UND KLASSIFIKATION MIT GRADIENTENVERFAHREN]
I. Grotrian-Steinweg, L. Schueler, and H. Wolff 1979 153 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVG-FBWT-79-07) Avail: NTIS HC A08/MF A01; DOKZENTBw, Bonn DM 40

The classification problem, a well known and important part of the theory of pattern recognition, is dealt with. The mixture of densities governing the incoming pattern process must be decomposed. A variety of algorithms for the decomposition of these mixtures is offered. Next, a classification procedure for the case of an unknown number of pattern classes is proposed and studied in detail. It is based on estimation of the gradient of the mixture by trigonometric series expansion. Other classification methods using the gradient technique are treated as well. Also included are studies on the reduction of dimensionality. Finally, linear algorithms which are able to follow an unknown trend are presented. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-14800 Wisconsin Univ. - Madison.
STRETCHING THE CIRCULAR CYLINDRICAL ELASTIC SHEET Ph.D. Thesis
Bonita Fay Bowman 1979 105 p
Avail: Univ. Microfilms Order No. 7922109

The behavior of the exact equations for an elastic circular cylinder which is deformed by a uniform pull at the ends keeping the end radii fixed was determined. It was found that the stresses were statistically determinant and that the equations reduced to a single nonlinear ordinary differential equation with boundary values. This equation was converted into a nonlinear integral equation. Using this equation, existence and uniqueness were proven and the appropriate linear theory for small values of the strains was determined. All results were verified by numerically solving the integral equation using Simpson's rule and the nonlinear Gauss-Seidel method. The truncation error was analyzed. The numerical results were also compared to the Bromberg-Stoker theory, and to another exact strain treatment due to Stoker. Dissert. Abstr.

N80-14801 Washington Univ., Seattle.
CONTRIBUTIONS TO CONSTRAINED OPTIMIZATION Ph.D. Thesis
Henry Parker Brandis, III 1979 86 p
Avail: Univ. Microfilms Order No. 7927749

A constructive descent algorithm is presented to find stationary points for the minimization of f(x) with x belonging to E, when f is a lower semi-continuous function and E is a member of a broad class of closed subsets of R sup n including convex sets and sets with nondifferentiable boundaries. The method used is similar to gradient projection type methods, and uses Clarke's tangent cone. A pseudo-projection having several properties analogous to those of the nearest point map for convex sets is developed and used in the algorithm to produce feasible points. In order to judiciously determine this mapping, a theory of approximating cones is developed, which also provides the algorithm with an anti-jamming property near corners of the constraint set. Convergence of the algorithm is proven using Goldstein's step-size technique. Computational results are given for several examples. Dissert. Abstr.

N80-14802 Washington Univ., Seattle.
STRONG SHAPE THEORY Ph.D. Thesis
Frederick William Cathey 1979 183 p
Avail: Univ. Microfilms Order No. 7927758

Strong shape theory using principles of general homotopy theory in the sense of Quillen was studied. It is shown that the strong shape category arises as a certain localization of the homotopy category of compacta. Of central importance in the development of strong shape theory are the notions of S-embedding and 'fibrant space'. An S-embedding is the shape version of a cofibration which is a homotopy equivalence, and a fibrant space is a metrizable space which is 'fibrant' with respect to the class of S-embeddings. It is shown that every compactum can be S-embedded in a fibrant space and that the correspondence determines a functor. Applications of the theory of S-embeddings and fibrant spaces are discussed. Dissert. Abstr.

N80-14803 State Univ. of New York at Stony Brook.
SPECTRAL INVARIANCE FOR NORMAL OPERATIONS UNDER TRACE CLASS PERTURBATIONS Ph.D. Thesis
Scott OHara 1979 100 p
Avail: Univ. Microfilms Order No. 7928462

An important result of perturbation theory known as the Kato-Rosenblum theorem is discussed. This theorem asserts that the absolutely continuous parts of two self adjoint operators whose difference is trace class are unitarily equivalent. Techniques for the treatment of spectral invariance problems are developed. The direct integral representation for normal operators is used throughout; unitary equivalence of the absolutely continuous parts (with respect to a sigma-finite Borel measure mu) translates in this context to the mu essential equality of the spectral multiplicity functions. For a subset gamma of the complex plane, and mu as above, the Kato-Rosenblum result holds for (gamma, mu) provided the spectral multiplicity functions of normal operators N sub 1, N sub 2 are mu essentially equal whenever N sub 1 - N sub 2 is trace class, and the spectra of N sub 1, N sub 2 lie in gamma. Dissert. Abstr.

N80-14804# Orange Free State Univ., Bloemfontein (South Africa). Dept. of Mathematical Statistics.
THE ASYMPTOTIC EXPANSION OF THE STEIN ESTIMATOR FOR THE MATRIX CASE WITH COVARIANCE MATRIX SIGMA HYPERON UNKNOWN
A. J. VanDermerwe and O. G. Nel Mar. 1979 14 p refs
Sponsored by CSIR and UOFS Res. Fund
(TR-41) Avail: NTIS HC A02/MF A01

The method used to determine the existence of estimators which dominate the maximum likelihood estimators for the problem of simultaneously estimating the means of three or more random variables was extended from the vector case to the matrix case. The asymptotic distribution, mean and variance of the Stein estimator was derived as well as that of the quadratic loss function for the matrix case with covariance matrix Sigma unknown. M.M.M.

N80-14805# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AUTOMATED NUMERICAL INTEGRATION OVER A TRIANGLE
D. P. Laurie Apr. 1979 21 p refs
(CSIR-TWISK-78) Avail: NTIS HC A02/MF A01

The metalgorithm concept is applied to automatic cubature over triangular regions. Special consideration is given to the computer representation of the smaller triangles generated. The design of cubature formulae with a built-in error estimate is discussed, and a 19-point formula of degree 8 that includes the points of the 7-point formula of degree 5 is derived. K.L.

N80-14806# National Research Inst. for Mathematical Sciences, Pretoria (South Africa). Operations Research and Statistical Div.

FINDING THE ROOT OF A MONOTONIC FUNCTION
Douglas M. Hawkins and J. S. Galpin Mar. 1979 12 p refs Sponsored in part by Control Data
(CSIR-TWISK-75) Avail: NTIS HC A02/MF A01

A FORTRAN algorithm is presented for solving the equation F(x) = y sub 0 where F is continuous and strictly monotonic. The algorithm is a generalization of the secant method, uses no derivatives, and is fast and stable. Author

N80-14807# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A MODEL FOR THE COMPUTATIONAL DETERMINATION OF PARAMETER VALUES OF ANTHROPOMORPHIC SEGMENTS
H. Hatze May 1979 65 p refs
(CSIR-TWISK-79) Avail: NTIS HC A04/MF A01

A model is presented for determining by computation the parameter values of anthropomorphic segments from a battery of 242 anthropometric measurements taken directly from the subject. The model consists of 17 segments, includes the shoulders as separate entities, and subdivides segments into small mass elements of different geometrical structures, thus allowing the shape and density fluctuations of a segment to be modelled in detail. The model differentiates between male and female subjects (exomorphic differences, different density functions and mass distributions), adjusts the densities of certain segmental parts according to the value of a special subcutaneous-fat indicator, and fully accounts for the specifities of pregnancy and obesity. The input data errors are drastically reduced by performing direct anthropometric measurements rather than indirect measurements from photo images and the overall accuracy of the model is better than 3% with a maximum error of about 5%. M.M.M.

N80-14808# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A NEW TEST FOR MULTIVARIATE NORMALITY AND HOMOSCEDASTICITY
Douglas M. Hawkins Sep. 1978 17 p refs
(CSIR-TWISK-45) Avail: NTIS HC A02/MF A01

Given data X sub ij j=1 to n sub i i=1 to g, a test was performed to determine whether the X sub ij are normal with common covariance matrix. Letting X sub i denote the mean of the i-th group and S the pooled covariance matrix, the quantities V sub ij = (X sub ij-X sub i) prime 1/S (X sub ij-X sub i) are used in the test. The exact null distribution of V sub ij is noted, and the Anderson-Darling statistic proposed for testing whether the data fit this null distribution. The test has several advantages over the tests currently being used. M.M.M.

N80-14809# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
LIMITS AND ADJOINT SITUATIONS IN MATHEMATICAL STRUCTURES
Gert Naude Mar. 1979 20 p refs
(CSIR-TWISK-67) Avail: NTIS HC A02/MF A01

Category theory is considered as a unifying language for various branches of mathematics. The concepts 'limit' and 'adjoint functor', as well as their duals, are introduced in a heuristic manner. The particular importance of the preservation of limits is stressed, and examples are given of adjoint functors found in algebra, topology and analysis. Finally various adjoint functors in categorical systems theory are discussed. Author

N80-14810# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
INDICATING CONES AND THE INTERSECTION PRINCIPLE FOR TANGENTIAL APPROXIMANTS IN ABSTRACT MULTIPLIER RULES
D. H. Martin, R. J. Gardner, and G. G. Watkins (South Africa Univ., Pretoria) Feb. 1979 32 p refs Sponsored in part by Control Data
(CSIR-TWISK-68) Avail: NTIS HC A03/MF A01

A partial ordering is established by generality among several specific notions of tangential approximation in the literature. The theory is unified through the introduction of an indicating cone. For solid cones, all notions of tangential approximant considered coincide. K.L.

N80-14811# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
GLOBAL SADDLE-POINT THEOREMS INVOLVING CONJUGATE-LIKE OPERATORS, FOR GENERAL AND QUASI-CONCAVE PROGRAMS
Jacob Flachs Mar. 1979 36 p refs Sponsored in part by Control Data
(CSIR-TWISK-72) Avail: NTIS HC A03/MF A01

General and quasi-concave nondifferentiable cases of the maximization problem are considered. With the aid of duality theory for mathematical programming involving conjugate-like operators, a bifunction that generates a class of perturbations is defined. Saddle-point theorems are presented, and equivalence is proved between the existence of a saddle-point and the existence of a certain cone-supporting property of the perturbation function. Possible improvements are suggested in multiplier methods. M.M.M.

N80-14812# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OPTIMAL STEERING OF A RANDOM MOTION OF A POINT MASS
Yaakov Yavin (Ben-Gurion Univ., Beer-Sheva, Israel) and Alida Jordan Mar. 1979 23 p refs Supported in part by Control Data
(CSIR-TWISK-71) Avail: NTIS HC A02/MF A01

A stochastic system is introduced representing the kinetics of a two dimensional random motion of a point mass. The point mass velocity is subjected to two different kinds of perturbations, the first represented by a vector of independent standard Wiener processes and the second by a vector of a generalized type of Poisson process. The control function is theta while v is kept fixed. The problem discussed is aimed at finding an optimal control law theta* = theta*(x), such that the point mass will reach a given target set in such a manner that the expected duration of its motion will be minimized and its probability of reaching the target set maximized. Sufficient conditions on optimal controls, of a dynamic programming type, are derived. These conditions require the existence of a smooth solution to a nonlinear partial integro-differential equations, which is solved here by applying a finite differences scheme. Numerical examples indicate that in many cases the line-of-sight control law can serve as a good approximation to an optimal control law. M.M.M.

N80-14813# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
COMPUTATION OF MOMENTS OF FUNCTIONALS OF A SOLUTION TO A STOCHASTIC DIFFERENTIAL EQUATION
Yaakov Yavin (Ben-Gurion Univ., Beer-Sheva, Israel) and W. C. Huisman (Twente Univ. of Technology, Enschede, Netherlands) Mar. 1979 32 p refs
(CSIR-TWISK-73) Avail: NTIS HC A03/MF A01

A set of partial integro-differential equations for the computation of E sub x (z(x;v) to the k power, k = 1,2,....., is derived. A nonlinear stochastic second order system is given as a test case and two finite difference algorithms for the computation of E sub x (x(x;v*)) to the k power, k = 1,2,....., are suggested, where v* is a control law that maximizes E sub x z(x;v) on a class U of admissible controls. It is shown numerically that for L(x) = 1 there is a significant increase in the values of E sub x (z(x;v)) to the k power and m sub k (x;v) in comparison with the corresponding values of E sub x (z(x;0) to the k power and m sub k (x;0), when E sub x z(x;v) is maximized on U for k = 2,...5 at least. K.L.

N80-14814*# Brown Univ., Providence, R. I. Div. of Applied Mathematics.
APPROXIMATE AND EXACT NUMERICAL INTEGRATION OF THE GAS DYNAMIC EQUATIONS
Timothy S. Lewis and Lawrence Sirovich 1979 57 p refs (Grant NsG-1617)
(NASA-CR-162554) Avail: NTIS HC A04/MF A01 CSCL 12A

A highly accurate approximation and a rapidly convergent

numerical procedure are developed for two dimensional steady supersonic flow over an airfoil. Examples are given for a symmetric airfoil over a range of Mach numbers. Several interesting features are found in the calculation of the tail shock and the flow behind the airfoil. K.L.

N80-14815*# Institute for Atmosphere Optics and Remote Sensing, Hampton, Va.
ANALYTIC MODELING OF AEROSOL SIZE DISTRIBUTIONS
Aesarsh Deepack and Gail P. Box Nov. 1979 165 p refs
(Contract NAS1-15198)
(NASA-CR-159170) Avail: NTIS HC A08/MF A01 CSCL 12A

Mathematical functions commonly used for representing aerosol size distributions are studied parametrically. Methods for obtaining best fit estimates of the parameters are described. A catalog of graphical plots depicting the parametric behavior of the functions is presented along with procedures for obtaining analytical representations of size distribution data by visual matching of the data with one of the plots. Examples of fitting the same data with equal accuracy by more than one analytic model are also given. K.L.

N80-14816*# Old Dominion Univ. Research Foundation, Norfolk, Va.
INTEGRATING MATRICES FOR ARBITRARILY SPACED GRID POINTS Final Report, 30 May - 30 Aug. 1979
William D. Lakin Nov. 1979 33 p refs
(Contract NAS1-15648)
(NASA-CR-159172) Avail: NTIS HC A03/MF A01 CSCL 12A

Integrating matrices are derived for arbitrarily spaced grid points using either interpolating or least squares fit orthogonal polynomials. Several features of the equally spaced grid case are also discussed. K.L.

N80-14817# Los Alamos Scientific Lab., N. Mex.
CONTRIBUTION MONTE CARLO
A. Dubi and S. A. W. Gerstl Mar. 1979 56 p refs
(Contract W-7405-eng-36)
(LA-7849-MS) Avail: NTIS HC A04/MF A01

A comprehensive description of the contribution Monte Carlo method and its implementation in the general purpose MCNP code is presented along with results of the method for realistic nonhomogeneous, energy-dependent problems. DOE

N80-14818# Gesellschaft fuer Mathematik und Datenverarbeitung, Bonn (West Germany). Inst. fuer Planungs- und Entscheidungssysteme.
COMPARISON OF REGRESSION, DIFFERENCE AND RATIO ESTIMATES IN SAMPLE THEORY
Peter Hoschka and Hermann Schunck 1977 21 p refs
(GMD-Mitt-42) Avail: NTIS HC A02/MF A01

Different methods for the expansion of sample characteristics to the total population from regression estimates are discussed. Well known results from regression and difference estimates are summarized and a generalized ratio estimate is suggested. All estimates are derived from one general form which also allows direct computation from a sample. Various sample designs are discussed; simple criteria for the comparison of the different expansion methods are suggested which are helpful especially for experimental purposes. Author (ESA)

N80-14819# European Space Agency, Paris (France).
FIELD COMPUTATION BY THE GEOMETRICAL THEORY OF DIFFRACTION
A. Schrott May 1979 94 p refs Transl. into ENGLISH of 'Feldberechnungen mit Hilfe der geometrischen Beugungstheorie', DFVLR, Oberpfaffenhofen, West Ger. Report DFVLR-FB-78-06, 16 Jun. 1978 Original German report available from DFVLR, Cologne DM 33,00
(ESA-TT-594; DFVLR-FB-78-06) Avail: NTIS HC A05/MF A01

The canonical problems of diffraction by a convex surface and the diffraction by a wire, which are of great practical interest, are treated. The first case is treated for the source placed away from and on the surface. For the illuminated region, the shadow region and the transition region separate solutions are derived. The problem of the field computation at caustics is investigated in detail for a circular edge. Applying the concept of the so called equivalent edge currents caustic correction factors for the field of the geometrical theory of diffraction at caustics are derived. Author (ESA)

N80-14820# European Space Agency, Paris (France).
SOLUTION OF ELECTROMAGNETIC BOUNDARY VALUE PROBLEMS OF COMPLICATED STRUCTURES. THEORY OF THE INTEGRAL EQUATION METHOD
Volker Stein May 1979 93 p refs Transl. into ENGLISH of 'Loesung elektromagnetischer Randwertprobleme bei komplizierten Struckturen. Grundlagen der Integralgleichungsmethode', DFVLR, Oberpfaffenhofen, West Ger. Report DFVLR-FB-78-01, 26 Jan. 1978 Original report in GERMAN previously announced as N79-16184 Original German report available from DFVLR, Cologne DM 30,40
(ESA-TT-596; DFVLR-FB-78-01) Avail: NTIS HC A05/MF A01

The theory for the determination of the radiation and scattering behavior of complicated structures with the aid of the integral equation method was studied. These structures may be complicated isolated radiators or shapes like helicopters or satellites, which are excited by an electromagnetic wave. The objective of the integral equation method is the determination of the surface currents, from which all electromagnetic parameters may be computed. For this reason two independent integral equations for the electric and magnetic field are derived from the vector wave equations by means of the second Greens' theorem. The field of application of these two equations is discussed in detail. Author (ESA)

N80-14821# European Space Agency, Paris (France).
NUMERICAL SOLUTION OF THE ELECTRIC AND MAGNETIC FIELD INTEGRAL EQUATIONS
Volker Stein May 1979 102 p refs Transl. into ENGLISH of 'Numerische Loesung der Integralgleichungen fuer das elektrische und magnetische Feld', DFVLR, Oberpfaffenhofen, West Ger. Report DFVLR-FB-78-05, 16 June 1978 Original German report available from DFVLR, Cologne DM 34,60
(ESA-TT-597; DFVLR-FB-78-05) Avail: NTIS HC A06/MF A01

The currents on the surface of a structure, excited by an electromagnetic wave, are determined by numerical solution of an integral equation for the electric or magnetic field. The integral equation is converted into a linear system of equations with the aid of the method of moments. This system of equations is also obtained by applying the reaction concept. Both methods are treated in detail. Mathematical models for the surface as well as some special numerical procedures are described extensively. Special attention is paid to the problem of minimizing computer storage space and computation time. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-14822 Florida State Univ., Tallahassee.
QUALITATIVE DEPENDENCY AMONG RANDOM VARIABLES, WITH APPLICATIONS IN PROBABILITY AND STATISTICS Ph.D. Thesis
Abdul-Hadi Ahmed 1979 108 p
Avail: Univ. Microfilms Order No. 7926707

A basic theorem was obtained showing that generalized association was inherited under certain commonly encountered mixing processes. Applications of this theorem were made by considering particular types of ordering, such as absolute value ordering, unimodal ordering as well as the standard linear ordering of the real numbers. Properties and theory for positive orthant dependence, a multivariate extension of Lehmann's positive quadrant dependence, and right tail increasing in sequence dependence, a multivariate extension of Esary and Proschan's bivariate right tail increasing dependence were developed. Applications were obtained in the form of inequalities and

monotonicity in a wide variety of multivariate statistical problems, including MANOVA, contingency tables, dependence measurement, competing risk models, reliability of series systems, and distribution theory. Dissert. Abstr.

N80-14823 Purdue Univ., Lafayette, Ind.
ON BAYES AND GAMMA-MINIMAX SUBSET SELECTION RULES Ph.D. Thesis
Woo-Chul Kim 1979 116 p
Avail: Univ. Microfilms Order No. 7926398

A study of the problem of selecting good populations from a set of given populations is presented as well as the problem of partitioning k treatment populations with regard to control population. A selection problem arising in reliability theory is discussed along with the selection in terms of scale parameters. Dissert. Abstr.

N80-14824 Cornell Univ., Ithaca, N. Y.
RANDOMIZATION PROCEDURES FOR A TWO WAY ANALYSIS OF ORIENTATION DATA Ph.D. Thesis
Thomas Spring Graves 1979 200 p
Avail: Univ. Microfilms Order No. 7926901

Several likelihood ratio and goodness of fit tests are developed for the analysis of a two way classification of discrete directional data. The problem is formulated to represent the directions as the vertices of a rotatable regular polygon. A single vertex emits a signal which may or may not affect a test animal placed at the center and allowed to move in any of the available directions. The null hypothesis is that the signaling vertex has no effect upon the test animal. The alternative is that the test animals do orient themselves with respect to the rotatable signal. Two cases of the alternative are examined. In the first case all test animals are assumed to be independently governed by the same probability distribution of directional responses to the signal. In the second case, the response distributions are assumed to be unique to the individual animals. Tests are developed for each case, of the alternative, and the asymptotic distributions of these tests are ascertained for the number of vertices, approaching infinity. Simulation results show that no single test is uniformly most powerful for all sample sizes and under all alternative distributions. Dissert. Abstr.

N80-14825 Virginia Univ., Charlottesville.
AN INVESTIGATION OF THE POWER EFFICIENCY OF THE FRIEDMAN NONPARAMETRIC ANOVA TEST WITH RESPECT TO THE ONE FACTOR REPEATED MEASURES ANOVA F-TEST Ph.D. Thesis
Pamela Rose Getson 1978 174 p
Avail: Univ. Microfilms Order No. 7928048

The Friedman two-way analysis of variance and the one factor additive model repeated measures analysis of variance were applied to Monte-Carlo generated data in order to explicate trends in relative power efficiency for the two tests under small sample cases. The Friedman was found to be generally slightly less powerful than the parametric repeated measures analysis of variance F test. Power efficiency computed as a grand average over all 700 conditions and all alpha levels was .7506. When relative power efficiency is calculated without the cases requiring exact probability testing, it was .7773. Deleting these cases and testing at alpha > 01 yielded a relative power efficiency of .8170. Dissert. Abstr.

N80-14826 Oklahoma State Univ., Stillwater.
A GENERAL SOLUTION TO MAKING INFERENCES ABOUT THE PARAMETERS OF MIXED LINEAR MODELS Ph.D. Thesis
Mohamed Kadri Gharraf 1979 44 p
Avail: Univ. Microfilms Order No. 7928206

The variance components in mixed linear models are estimated. The conditional posterior distribution of the fixed effects, random effects, error variance, and variance components are obtained using Bayesian approach. Improper prior distribution for the fixed effects is considered, and conjugate type prior distributions are considered for the random effects, the error precision, and the inverse of the variance components. The vector of the fixed effects is estimated by the location vector of the p-variate t distribution. An approximation of the mode of the marginal posterior distribution of the vector of random effects is used as a conditioning value. The approximate posterior mode is the same as the least square estimator in the reduced model. The estimators of the variance components and error variance are the conditional posterior means of these parameters, conditioned on the least square estimate of the random effects. Dissert. Abstr.

N80-14827 Minnesota Univ., Minneapolis.
CATEGORICAL DATA MODELS FOR COMPLEX SAMPLING SCHEMES Ph.D. Thesis
Stephen Samuel Brier 1979 148 p
Avail: Univ. Microfilms Order No. 7926096

Models for contingency tables arising from complex sampling schemes are considered. The notion of a superpopulation is used to represent both stratified and cluster sampling schemes. In stratified samples, Bayesian methods are used to estimate cell probabilities and although some potentially useful results are obtained, these methods are somewhat intractable. For cluster sampling the Dirichlet-Multinomial distribution is used to model the superpopulation and leads to relatively simple extensions of results for multinomial distributions. In particular, it is shown that goodness of fit statistics are easily modified to test the fit of log-linear models under cluster sampling. It is shown that these modified tests behave well, both in terms of power and in terms of agreement with asymptotic approximations. Dissert. Abstr.

N80-14828/ National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OPTIMAL CONTROLS THAT MAXIMIZE THE PROBABILITY OF HITTING A SET OF TARGETS: A NUMERICAL STUDY
Yaakov Yavin (Ben-Gurion Univ., Beer-Sheva, Israel) and Alida M. Jordan May 1979 39 p Supported in part by Control Data
(CSIR-TWISK-81) Avail: NTIS HC A03/MF A01

An optimal control law to be maximized on a given class of admissible control laws is discussed. Sufficient conditions on optimal controls, of a dynamic programming type, are derived. These conditions which require the existence of a smooth solution to a nonlinear partial integro-differential equation, is solved by applying a finite difference scheme. Two examples are dealt with numerically. M.M.M.

N80-14829/ National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
OPTIMAL SELECTION FROM A RANDOM SEQUENCE WITH OBSERVATION ERRORS
T. J. Stewart Mar. 1979 26 p refs
(CSIR-TWISK-69) Avail: NTIS HC A03/MF A01

A form of sequential decision problem is introduced in which options are presented in sequence, with no recall of rejected options (as in the secretary problem), but in which the value of each option may only be inferred from experiments. Decisions have thus to be made concerning both the acceptance and rejection of each option and the degree of experimentation. General properties of the optimal policy are derived, and an algorithm is obtained for the solution in a special case. This special case suggests a heuristic rule for more general situations, the performance of which rule has been investigated by a Monte Carlo study. Author

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N80-14830/ National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
TWO-TARGET PURSUIT-EVASION DIFFERENTIAL GAMES IN THE PLANE
W. M. Getz and M. Pachter Mar. 1979 30 p refs Supported in part by Control Data
(CSIR-TWISK-74) Avail: NTIS HC A03/MF A01

Two-target versions of the two cars game and the homicidal chauffeur game are introduced. A generic example of the

two-target homicidal chauffeur game is considered in detail and maps of the game and its corresponding winning strategies are found using Lyapunov methods of analysis. The effects of altering the speed and maneuverability ratios and the weapon system parameters are presented. It is found that certain winning strategies include a swerve type maneuver and that for certain sets of parameters, regions of 'stagnation' and different modes of draw occur. K.L.

N80-14831# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.
SPECTRAL ESTIMATION FROM IRREGULAR ARRAYS
F. P. Bretherton and J. C. McWilliams May 1979 180 p refs
(Grant NSF ATM-77-23757)
(PB-299363/2; NCAR/TN-138+STR) Avail: NTIS HC A09/MF A01 CSCL 12B

The problem of spectral estimation from data sampled at irregularly distributed measurement locations is considered from the point of view of an optimal fit of a spectral model when the amount of data available is large but finite. Several methods are shown to be asymptotically equivalent to the optimal one (as the amount of data becomes large), but several others, previously advocated, are shown to be either biased estimations or to have significantly larger estimation uncertainties than the optimal one. This problem is then reconsidered in a Bayesian formulation. The estimation problem is a combination of the prior prejudices of the investigator and the ability of the data to yield further information beyond the initial prejudices. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-14832 Yale Univ., New Haven, Conn.
BOOLEAN VALUED MODELS AND GALOIS THEORY FOR COMMUTATIVE REGULAR RINGS Ph.D. Thesis
Kay Ellen Smith 1979 103 p
Avail: Univ. Microfilms Order No. 7928097

An equivalence is established between the category of B-fields, where B is a complete Boolean algebra, and the category of commutative regular self-injective rings whose Boolean algebra of idempotents is equal to B. This equivalence is used along with the fact that ZFC is true in the universe of Boolean valued sets to develop a Galois theory for commutative regular self-injective rings. The necessary and sufficient conditions on a ring extension for the corresponding B-field extension to be Galois and algebraic are determined. Closed and patchable subgroups of a Galois group are defined and it is proven that the Galois group of a ring extension is patchable. The concepts of a finite dimensional ring extension and a bar-finite group of automorphisms are introduced and the associated dimension and order functions are defined. Galois Correspondence Theorems are obtained for both finite dimensional and infinite dimensional ring extensions. Dissert. Abstr.

N80-14833# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
RESULTS AND CONJECTURES ON COVERING METRIC SPACES
R. J. Gardner Feb. 1979 15 p refs
(CSIR-TWISK-70) Avail: NTIS HC A02/MF A01

A semiquantitative theory of covering metric spaces is studied. General results are obtained on fine covers, and are put forth. Most of these remain unanswered for subsets of the real line. K.L.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-14834# Naval Research Lab., Washington, D. C. Plasma Physics Div.
EQUILIBRIUM AND PROPAGATION OF A ROTATING RELATIVISTIC ELECTRON BEAM IN THE ABSENCE OF AN EXTERNAL GUIDE FIELD Interim Report
J. D. Sethian, K. A. Gerber, D. N. Spector, and A. E. Robson 28 Sep. 1979 36 p refs
(AD-A074803; NRL-MR-4071) Avail: NTIS HC A03/MF A01 CSCL 20/7

This paper describes an experimental and theoretical study of a charge-neutralized, hollow, rotating relativistic electron beam propagating inside a metal tube in the absence of an external magnetic guide field. A model has been developed in which the radial equilibrium is derived from the force balance on the beam interacting with its self-field, and the velocity of propagation of the beam is derived from the power balance. The experimental results show close agreement with the predictions of the model. GRA

N80-14835# Metal Properties Council, Inc., New York.
DEVELOPMENT OF A STANDARD METHODOLOGY FOR THE CORRELATION AND EXTRAPOLATION OF ELEVATED TEMPERATURE. VOLUME 1: A SUMMARY OF A STATE-OF-THE ART REVIEW AND A WORKSHOP Final Report
R. M. Goldhoff, S. S. Manson, J. B. Conway, C. R. Ensign, G. V. Smith, L. H. Sjodahl, and M. K. Booker Apr. 1979 214 p refs Sponsored by Electric Power Research Inst., Palo Alto, Calif.
(EPRI-FP-1062-Vol-1) Avail: NTIS HC A10/MF A01

A standard time temperature parametric procedure for the reliable correlation and extrapolation of elevated temperature creep and rupture data for the design of utility equipment is developed. The role of statistics in the procedure is discussed. The standardization of the technology of creep rupture data evaluation is discussed. A.W.H.

N80-14836# General Electric Co., Sunnyvale, Calif. Advanced Reactor Systems Dept.
LIQUID WEIGHING BY BUOYANCY TECHNIQUE
D. W. Jeter, D. E. Hafer, L. T. Hagle, and E. F. Kurtz Apr. 1979 26 p refs Presented at the 20th Ann. Meeting of the Inst. of Nucl. Mater. Management, Albuquerque, N. Mexico, 18 Jul. 1979
(Contract EN-77-C-03-1464)
(GEFR-SP-158; CONF-790707-26) Avail: NTIS HC A03/MF A01

A method to indirectly measure the mass of liquid in a tank is developed. This method (the bob displacement technique), which is based on Archimedes Buoyancy Principle, is described. The working equation is developed and reduced to a linear response equation which is unaffected by density. A prototype design for use on a plutonium/uranium nitrate feed tank was developed and is described. The water testing of this hardware is discussed. Typical fuel cycle applications and the material accountability considerations are included. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-14837 Maryland Univ., College Park.
A MONOLITHIC SURFACE ACOUSTIC WAVE CHARGE TRANSFER DEVICE Ph.D. Thesis
Nicholas Alexandrou Papanicolaou 1979 184 p
Avail: Univ. Microfilms Order No. 7926509

The excitation and propagation of surface acoustic waves in multilayered media is investigated. A SAW computer program is used to determine the optimum transducer configuration and structure dimensions to produce the highest coupling in the excitation of the piezoelectric waves. The conditions for the injection and capture of the trapped charge in the device, as well as the behavior of the charge in a travelling well are also examined. Fabrication, techniques such as substrate preparation, diffusion, oxidation, rf sputtering, metallization and other processes are discussed. Finally, charge transfer action in a SAW-CTD device

is demonstrated and possible applications in recirculating memory and imaging are discussed. Other applications may include signal processing such as pure analog delay at high frequency with low pass. Dissert. Abstr.

N80-14838 Cornell Univ., Ithaca, N. Y.
HIGH FREQUENCY BROADBAND ROTOR NOISE Ph.D. Thesis
Young-Nam Kim 1979 184 p
Avail: Univ. Microfilms Order No. 7926922

A method to find the absolute spectral level of high frequency far field sound of a subsonic aerodynamic rotor in terms of random load fluctuations on the rotor blades was developed. The analysis deals with frequencies where the radiated sound spectrum is smooth, i.e., above 300 to 400 Hz for a typical helicopter. A point load approximation with spanwise loading corrections is used to represent the blade loadings. The method is applied to atmospheric turbulence induced loadings and to the calculation of trailing edge noise from a rotor. Dissert. Abstr.

N80-14839 Wisconsin Univ. - Madison.
ULTRASONIC BROAD BAND PULSE-ECHO BEAM PROFILE ANALYSIS IN NONATTENUATING AND ATTENUATING MEDIA Ph.D. Thesis
Richard Alan Banjavic 1979 172 p
Avail: Univ. Microfilms Order No. 7921544

Ultrasonic pulse echo beam profiles are examined as a means of estimating the resolution capabilities of a transducer pulser receiver network when such a system is employed for clinical scanning. The broad band pulse echo beam profiles are determined for paths containing soft tissues or tissue equivalent media which is similar to tissue in physical density and acoustic speed of sound and attenuation coefficient. These profiles are compared to similar profiles derived in nonattenuating media and to predictions derived from models based on continuous wave transmission. Dissert. Abstr.

N80-14840*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EVALUATION OF HELICOPTER NOISE DUE TO B BLADE-VORTEX INTERACTION FOR FIVE TIP CONFIGURATIONS
Danny R. Hoad Dec. 1979 80 p refs Prepared jointly with AVRADCOM, Hampton, Va.
(DA Proj. 1L2-62209-AH-76)
(NASA-TP-1608; AVRADCOM-TR-80-B1; L-13207) Avail: NTIS HC A05/MF A01 CSCL 20A

The effect of tip shape modification on blade vortex interaction induced helicopter blade slap noise was investigated. Simulated flight and descent velocities which have been shown to produce blade slap were tested. Aerodynamic performance parameters of the rotor system were monitored to ensure properly matched flight conditions among the tip shapes. The tunnel was operated in the open throat configuration with treatment to improve the acoustic characteristics of the test chamber. Four promising tips were used along with a standard square tip as a baseline configuration. A detailed acoustic evaluation on the same rotor system of the relative applicability of the various tip configurations for blade slap noise reduction is provided. R.C.T.

N80-14841# Materials Research Labs., Melbourne (Australia).
UNDERWATER SOUND SCATTERING BY MARINE ORGANISMS. A REVIEW
Ian C. Dunstan Aug. 1979 29 p refs
(MRL-R-756; AR-001-838) Avail: NTIS HC A03/MF A01

Scattering of acoustic energy by inhomogeneities within the water column, or volume reverberation, is a major source of interference to underwater sonar systems. As naval defence systems have a high dependence on acoustic detection, knowledge of the factors that affect sonar interference is relevant to defence interests. The literature on interference to sonar propagation by marine organisms is reviewed, with particular emphasis on Australian waters. Acoustic scattering in the ocean generally occurs in discrete layers called deep scattering layers. Theoretical and experimental investigations show conclusively that the scattering is caused by marine organisms. Reverberation profiles are dominated by the resonance back-scattering from gas-filled swimbladders of midwater fish, particularly at frequencies between 0.5 and 20 kHz. At higher frequencies, scattering from fish tissue and planktonic organisms becomes significant. Information on the identity and acoustic properties of sound scattering organisms within the Australian region is sparse. Author

N80-14842*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
EFFECTS OF FRICTION AND HEAT CONDUCTION ON SOUND PROPAGATION IN DUCTS
Patrick Huerre and K. Karamcheti Aug. 1976 159 p refs
(Grants NsG-2007; NGL-05-020-275; NGL-05-020-526)
(NASA-CR-162556; JIAA-TR-4) Avail: NTIS HC A08/MF A01 CSCL 20A

The theory of sound propagation is examined in a viscous, heat-conducting fluid, initially at rest and in a uniform state, and contained in a rigid, impermeable duct with isothermal walls. Topics covered include: (1) theoretical formulation of the small amplitude fluctuating motions of a viscous, heat-conducting and compressible fluid; (2) sound propagation in a two dimensional duct; and (3) perturbation study of the inplane modes. A.R.H.

N80-14843*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACOUSTIC CONSIDERATIONS OF FLIGHT EFFECTS ON JET NOISE SUPPRESSOR NOZZLES
U. vonGlahn 1979 26 p refs Presented at the AIAA 18th Aerospace Sci. Meeting, Pasadena, Calif., 14-16 Jan. 1980
(NASA-TM-81377; E-282; AIAA-Paper-80-0164) Avail: NTIS HC A03/MF A01 CSCL 20A

The inflight acoustic characteristics of high velocity jet noise suppressor nozzles for supersonic cruise aircraft were reviewed. The inflight effects at the peak noise level were discussed. Both single and inverted velocity profile multistream suppressor nozzles were considered. The importance of static spectral shape on the noise reduction due to inflight effects was stressed. R.C.T.

N80-14844# Naval Research Lab., Washington, D. C.
RAYSTC: A COMPUTER CODE FOR CALCULATING SINGLE RAY-PATH STATISTICS, ASSUMING THE GARRETT-MUNK MODEL OF INTERNAL WAVES Interim Report
M. L. Blodgett 25 Jul. 1979 32 p refs
(ZF52552003)
(AD-A073762; AD-E000317; NRL-8304) Avail: NTIS HC A03/MF A01 CSCL 20/1

This report describes a computer program designed to calculate root-mean-square values for the acoustic phase, phase rate, and log-intensity fluctuation for a single ray path in an ocean in which the sound-speed fluctuations are the result of internal-wave activity. It is assumed that the internal waves can be described by the Garrett-Munk internal-wave model and that the theory of sound propagation developed by Munk and Zachariasen is valid. GRA

N80-14845# Pennsylvania State Univ., University Park. Applied Research Lab.
DIGITAL WAVEFRONT RECONSTRUCTION FOR ACOUSTICAL APPLICATIONS
Robert L. Cohen 12 Jul. 1979 223 p refs
(Contract N00024-79-C-6043)
(AD-A073775; ARL/PSU/TM-79-132) Avail: NTIS HC A11/MF A01 CSCL 17/1

The work presented is an extension of research in acoustical holography as a tool for sound source location; this research being centered on digital processing and computer graphics imaging. Holographic images of plates vibrating below coincidence frequency show radiation from regions of discontinuity and not from other regions. Digitally reconstructed images from acoustic holograms show the radiating part (far-field component) of the pressure at the source location. The image may be interpreted as a monopole distribution which would generate the same far field as did the original source distribution. A near-field scan records the entire field and yields an image which is proportional to the surface velocity of the plate. It shows the modal pattern of the plate vibration. The holographic far-field image is approximately equivalent to the near-field image with the high wave numbers filtered out. Since the far field contains spatial frequencies only up to 1/lambda, image resolution is limited by

the acoustic wavelength; i.e., the ideal image is convolved with an Airy pattern. GRA

N80-14845# Pennsylvania State Univ., University Park. Applied Research Lab.
RADIATED NOISE DUE TO BOUNDARY-LAYER TRANSITION
G. C. Lauchle 23 Jul. 1979 52 p refs
(Contract N00024-79-C-6043)
(AD-A073491; ARL/PSU/TM-79-135) Avail: NTIS HC A04/MF A01 CSCL 17/1

A theory is presented for the noise radiated by incompressible boundary-layer transition that occurs on an infinite, rigid flat plate. It is hypothesized that it is the intermittency of the boundary-layer flow within the transition zone that is dominant in noise production. Using Lighthill's analogy, it is shown that dipole, quadrupole, and octupole sources are generated. The dipole sources are attributable to the shear stress fluctuations that occur in transitional flow while the others are due to fluctuating Reynolds stresses and their images. Under the assumption that dipole sources are more efficient than quadrupoles or octupoles when the Mach number is very small, the power spectrum of the radiated noise due to the dipole contribution is derived. The spectral level rises at 6 db/octave, peaks at a frequency corresponding to the time it takes for a turbulence burst to move through the transition region, and then drops off again at 6 dB/octave. The radiation efficiency is analyzed and found to be quite low; it is only 20 percent of that for a fully-developed turbulent boundary layer flow. GRA

N80-14847# Pennsylvania State Univ., University Park. Applied Research Lab.
TRANSIENT RESPONSE OPTIMIZATION OF PIEZOELECTRIC DISC TRANSDUCERS BY TIME DOMAIN TECHNIQUES Ph.D. Thesis
Henry Alan Wolf 23 Jul. 1979 252 p refs
(Contract N00024-79-C-6043)
(AD-A073818; ARL/PSU/TM-78-139) Avail: NTIS HC A12/MF A01 CSCL 17/1

The goals of this research have been to find and demonstrate design procedures for reducing the mechanical ringing of piezoelectric disc transducers under impulsive electrical excitation. The transducer has been treated as a three-port device: the two mechanical ports and one electrical port. Improvements to the transient response have been sought through the determination of appropriate matching networks at the ports. The optimization of specified time domain characteristics is accomplished by performing a gradient search over a parameter space defining the port matching configurations. It is assumed that only one mechanical port radiates into the acoustic medium. The transducer and mechanical matching sections are modeled using the Mason equivalent circuit and the distributed parameter wave guide model, respectively. Transformation to the time domain is achieved using a numerical approximation to the Laplace transformation. GRA

N80-14848# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 125: F-105D AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Oct. 1978 132 p
(AF Proj. 7231)
(AD-A073616; AMRL-TR-75-50-Vol-125) Avail: NTIS HC A07/MF A01 CSCL 01/3

The USAF F-105-D is a multipurpose, adverse weather fighter-bomber aircraft powered by a J75-P-19W turbojet engine. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for five engine-power conditions. Near-field data are reported for eight locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-14849# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 129: F-100 AIRCRAFT IN THE AF32A-16 NOISE SUPPRESSOR, NEAR AND FAR-FIELD NOISE
Robert G. Powell Nov. 1978 86 p
(AF Proj. 7231)
(AD-A073793; AMRL-TR-75-50-Vol-129) Avail: NTIS HC A05/MF A01 CSCL 01/3

Measured and extrapolated data defining the bioacoustic environments produced by an F-100 operating in a noise suppressor for four engine power configurations. Near-field data are reported for three locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75-8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. Refer to volume 1 of this handbook, 'USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application', AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. GRA

N80-14850# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 137: F-101B AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Oct. 1978 134 p
(AF Proj. 7231)
(AD-A073617; AMRL-TR-75-50-Vol-137) Avail: NTIS HC A07/MF A01 CSCL 01/3

The USAF F-101B is a long-range, all-weather supersonic fighter-interceptor aircraft powered by two J57-P55 turbojet engines. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for five engine-power conditions. Near-field data are reported for ten locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75 - 8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-14851# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 138: F-102A AIRCRAFT, NEAR AND FAR-FIELD NOISE
Robert G. Powell Oct. 1978 127 p refs
(AF Proj. 7231)
(AD-A073618; AMRL-TR-75-50-Vol-138) Avail: NTIS HC A07/MF A01 CSCL 01/3

The USAF F-102A is a remotely controlled aircraft and was a supersonic all-weather fighter-interceptor aircraft powered by one J57-P-23 turbojet engine. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for five engine-power conditions. Near-field data are reported for six locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors.

Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75 - 8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N80-14852# National Bureau of Standards, Washington, D.C. Center for Mechanical Engineering and Process Technology.
RECENT IMPROVEMENTS TO THE ASTM-TYPE ULTRASONIC REFERENCE BLOCK SYSTEM Final Report, 1 Jan. 1976 - 31 Jan. 1979
Daniel J. Chwirut Jul. 1979 57 p refs
(Contract F33615-76-F-5751; AF Proj. 7381)
(AD-A074724; AFML-TR-79-4080) Avail: NTIS HC A04/MF A01 CSCL 14/2

Recent activities aimed toward improving the ASTM-type ultrasonic reference block system are described. On the aluminum block system (ASTM E127 and NBS TN 924), efforts were focused on better definition of the measurement equipment (transducer and instrument), the implementation of a Measurement Assurance Program and Loaner Block Service, and modeling of the distance-amplitude relationship. It is shown that a large increase in the precision of reference block readings is easily achievable by implementing simple changes and controls in the measurement procedure. On steel and titanium blocks (e.g. ASTM E-428), efforts were directed toward quantifying the extent of reproducibility possible among blocks fabricated by both conventional drilling and by diffusion bonding. Reasonable reproducibility is achievable by both, with the diffusion-bonding process offering both advantages and disadvantages. GRA

N80-14853# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE ANALYSIS OF SOUND PROPAGATION IN JET ENGINE DUCTS USING THE FINITE DIFFERENCE METHOD Interim Report, Nov. 1975 - Nov. 1978
Dennis W. Quinn Jun. 1979 60 p refs
(AD-A074233; AFFDL-TR-79-3063) Avail: NTIS HC A04/MF A01 CSCL 20/1

In this report, the author derives the partial differential equations which describe sound propagation in jet engine ducts and then presents a finite difference approach for solving these equations. Also included is a computer program listing, sample input and sample output. The program can handle uniform rectangular and cylindrical ducts with or without uniform flow. In addition, if a mapping function which maps a nonuniform duct to a uniform duct is specified, the program can determine sound fields in nonuniform ducts in the absence of flow. GRA

N80-14854# Johns Hopkins Univ., Baltimore, Md. School of Engineering.
OPTICAL PROBING OF ACOUSTIC EMISSION WAVES Final Report, 15 Feb. 1976 - 30 Jun. 1979
C. Harvey Palmer and Robert E. Green, Jr. 31 Aug. 1979 75 p refs
(Grants DAAG29-76-G-0160; DAAG29-78-G-0050)
(AD-A074160; ARO-13666.6-MSX) Avail: NTIS HC A04/MF A01 CSCL 20/1

Optical probing is a newly developed technique for quantitative study of acoustic emission. It has great advantages over other techniques, especially piezoelectric probing: it is non-contract and does not disturb the signals, it is absolutely calibrated, has a sensitive area only tens of microns in diameter, can make measurements within a millimeter of a source, can be used to probe internally in transparent materials, and has an extremely wide, flat bandwidth. With the optical probe we have measured extremely short rise times, amplitudes of 1 to 10 angstroms, and signals characteristics of their sources, at least in some cases. GRA

N80-14855# Science Applications, Inc., McLean, Va.
ACOUSTIC IMPLICATIONS OF MESOSCALE OCEANOGRAPHIC PHENOMENA Final Report
Lorna S. Blumen and John S. Hanna 31 May 1979 114 p refs Original contains color plates
(Contract N00014-77-C-0696)
(AD-A074456; SAI-80-926-W/A) Avail: NTIS HC A06/MF A01 CSCL 20/1

This volume documents an investigation into the effects of mesoscale oceanographic features on underwater acoustic propagation. A recent eddy model is evaluated for its application to acoustic analysis. The effects of range-dependence, source-receiver geometry, and source frequency are examined. Descriptive statistics are used to provide a quantitative measure of the energy redistribution caused by the presence of an eddy. GRA

N80-14856# Los Alamos Scientific Lab., N. Mex.
SOUND VELOCITY AND EQUATION-OF-STATE MEASUREMENTS IN HIGH PRESSURE FLUID AND SOLID HELIUM
D. H. Liebenberg, R. L. Mills, and J. C. Bronson 1979 6 p refs Presented at the Intern. AIRAPT Conf., La Creusot, France, 30 Jul. 1979
(Contract W-7405-eng-36)
(LA-UR-79-721; CONF-790709-1) Avail: NTIS HC A02/MF A01

A piston-cylinder apparatus was used to obtain P, V, T, and simultaneous values of longitudinal sound velocity in helium fluid throughout the ranges 75 to 300 K and 3 to 20 kbar. Measurements of the compressibility are compared with those obtained along the 4 K isotherm up to 20 kbar. The use of helium as a pressure medium in high pressure diamond anvil cells is discussed. DOE

N80-14857# California Univ., Livermore. Lawrence Livermore Lab.
MEASUREMENT OF SOUND VELOCITY IN LIQUID METALS
G. R. Gathers 10 May 1979 19 p refs
(Contract W-7405-eng-48)
(UCID-18171) Avail: NTIS HC A02/MF A01

Techniques for measuring sound velocity in liquid metals using transducers are reviewed. A dynamic noncontacting method intended to measure sound velocity in liquid uranium and which uses an argon-ion laser with a displacement interferometer is described. Measurements with liquid lead, and liquid uranium are discussed. DOE

N80-14858# Advisory Group for Aerospace Research and Development, Paris (France).
SPECIAL COURSE ON ACOUSTIC WAVE PROPAGATION
Aug. 1979 224 p refs In ENGLISH; partly in FRENCH Presented at the Von Karman Inst., Rhode-Saint-Genese, Belgium, 28 May - 1 Jun. 1979
(AGARD-R-686; ISBN-92-835-0248-5) Avail: NTIS HC A10/MF A01

The propagation of acoustic waves in inhomogeneous and moving media of both unlimited and finite extent is discussed with particular emphasis on modelling of the phenomena involved and on prediction methods, as well as standardization aspects. Measurement techniques and data analysis are also considered. Applications of the material presented occur in aeroacoustics, industrial acoustics and atmospheric propagation. For individual titles, see N80-14859 through N80-14876.

N80-14859# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A GENERAL SURVEY OF STUDIES ON ACOUSTIC WAVE PROPAGATION [APERCU GENERAL DES ETUDES SUR LA PROPAGATION DES ONDES ACOUSTIQUES]
M. Perulli *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 5 p refs In FRENCH Prepared jointly with Univ. de Technologie de Compiegne, France (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

A brief historical review of theoretical and experimental research in acoustic wave propagation is presented. Some of the different themes which must be addressed in order to increase the state of knowledge in this particular domain of acoustics concern popagation in ideal and nonideal media.
Transl. by A.R.H.

N80-14860# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ACOUSTIC EQUATIONS IN MOVING FLUIDS
P. E. Doak *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 6 p refs (For primary document see

N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The full transport equations of mass, momentum and energy of an arbitrarily moving, thermally inhomogeneous, fluid are considered, and also appropriate definitions of 'acoustic motion' in such circumstances, leading to the partial differential equations and boundary conditions governing such motion. The fundamental nature of the convective, refractive, diffractive and diffusive effects of the fluid motion and thermal inhomogeneity on the acoustic motion is made evident. A classification is made of types of problems that have been, and can be, solved, and of the kinds of interactions that can occur between acoustic and other kinds of motions. Author

N80-14861# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
FUNDAMENTALS OF SOUND REFLECTION AND REFRACTION IN INHOMOGENEOUS MEDIA
Roland Stuff *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 19 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The historical development of geometrical acoustics is reviewed and sound wave propagation is examined including the effects of temperature and wind gradients. Analytical solutions of the wave equation are presented for an isothermally and a polytropically stratified still atmosphere and for an atmosphere with wind gradients and wind direction changes as well. These solutions are valid beyond the scope of geometrical acoustics. The dispersion of infrasound is also considered. A.R.H.

N80-14862# Southampton Univ. (England). Inst. of Sound and Vibration Research.
MATHEMATICAL TECHNIQUES FOR ACOUSTIC PROPAGATION PROBLEMS
P. E. Doak *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 7 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The principal mathematical techniques for the solution of both steady state and transient acoustic propagation and boundary value problems, for both forced and free motion, are reviewed. These include separation of variables methods and the associated techniques for the resulting ordinary differential equations, Green function methods, Fourier, Laplace and other transform methods, finite element and other numerical methods, and certain special techniques including Wiener-Hopf. Emphasis is placed on the relative merits of the various methods for specific types of problems. Author

N80-14863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DIRECTIVITY OF ACOUSTIC RADIATION FROM SOURCES
Donald L. Lansing *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 11 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01 CSCL 20A

The radiation properties of acoustic monopoles and dipoles are described, as well as the directivity of radiation from these sources in a free field and in the presence of an absorptive surface. The kinematic effects on source radiation due to translation and rotation are discussed. Experimental measurements of sound from an acoustic monopole in motion and the characteristics of helicopter rotor and propeller noise are reviewed. Several essential concepts required by noise control engineers making measurements of noise from moving sources in the proximity of the ground are introduced. A.R.H.

N80-14864# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PROPAGATION IN DUCTS [PROPAGATION DANS LES CONDUITS]
M. Perulli *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 23 p In FRENCH Prepared jointly with Univ. de Technologie de Compiegne, France (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The study of acoustic wave propagation in ducts is accomplished by beginning with a wave equation in which the following come into play: duct geometry, the median heights and fluctuations characterizing the fluid, and the acoustic properties of the walls. Generally, this equation can be solved only by complex numerical methods and, to this day, only the particular cases which correspond to simple geometries can be treated analytically. Numerous physical properties are presented and the case is discussed for an infinite duct of any section but constant, in which a uniformly homogeneous fluid flows; the acoustic impedance of the walls can or can not be absorbent. An expression for the pressure field is given for different duct geometries (rectangular, annular, and cylindrical).
Transl. by A.R.H.

N80-14865# Office National d'Etudes et de Recherches Aerospatiales, Paris (France). Dept. de Genie Macanique.
PROPAGATION IN ACOUSTICALLY ABSORBENT MATERIALS
M. Perulli and P. E. Doak (Inst. of Sound and Vibration Research) *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 6 p refs Prepared jointly with Southampton Univ., England (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

Models for representing the dynamics of porous and other acoustically absorbent materials are reviewed. Propagation in significantly absorbent materials widely used in practice, or commonly occurring, for example, as outdoor ground surfaces, is discussed. Non-linear high amplitude effects and mean flow effects are briefly described. A.R.H.

N80-14866# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ACOUSTIC ENERGY
C. L. Morfey *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 7 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

Acoustic energy equations are shown to be a consequence of the linearized equations of motion. Definitions of acoustic energy density and flux are given for sound fields in fluids at rest, and in various types of mean flow. Several applications to flow-acoustic problems are discussed, involving the transmission of sound through jets and shear layers and along lined flow ducts. Author

N80-14867# Southampton Univ. (England). Inst. of Sound and Vibration Research.
ABSORPTION OF SOUND WAVES IN THE ATMOSPHERE
C. L. Morfey *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 12 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

Absorption processes for sound waves in gases are described, with particular emphasis on atmospheric propagation over the frequency range 10 Hz to 10 to the 5th power Hz. The topics covered include molecular transport processes (viscosity, heat conduction and diffusion in mixtures); rotational relaxation in air; vibrational relaxation of N2 and O2 molecules in air and the influence of humidity; radiative heat transfer due to water vapor; viscothermal absorption due to suspended particles, and the additional effects arising from droplet evaporation in fogs. In each case, graphs or formulae for estimating atmospheric attenuation are provided, together with references to further information. Dissipative effects in nonlinear waves, sonic boom rise times in the atmosphere, and the spectral distortion of high-intensity noise are considered. A.R.H.

N80-14868*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIMENTAL MEASUREMENTS OF MOVING NOISE SOURCES
L. Maestrello and T. D. Norum *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 12 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01 CSCL 20A

The far-field pressure was measured from three different types of moving sources: a point monopole, a small model jet,

and an aircraft. Results for the pressure time history produced by the point source show good agreement with those predicted analytically. Both actual and simulated forward motion of the model jet show reductions in noise levels with forward speed at all angles between the source and observer. Measurement with the aircraft over both an anechoic floor and over the ground yields a method for evaluating the transfer function for ground reflections at various angles between the moving aircraft and measurement position. A.R.H.

N80-14869# Southampton Univ. (England). Inst. of Sound and Vibration Research.
PROPAGATION FROM MOVING SOURCES IN FLOWS
C. L. Morfey *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 13 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The theory of sound radiation from moving sources is outlined, first for uniform media and then for certain cases of nonuniform flow. Various applications are discussed which relate to aircraft noise in flight. K.L.

N80-14870*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Aeroacoustics Branch.
APPLICATIONS OF DIFFRACTION THEORY TO AEROACOUSTICS
Donald L. Lansing, Chen-Huei Liu, and Thomas D. Norum *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 12 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01 CSCL 20A

The fundamentals of diffraction theory were reviewed and applied to several problems of aircraft noise generation, propagation, and measurement. The general acoustic diffraction problem is defined and the governing equations were set down. Diffraction phenomena are illustrated using the classical problem of the diffraction of a plane wave by a half-plane. Infinite series and geometric acoustic methods for solving diffraction problems are described. Four applications of diffraction theory are discussed: the selection of an appropriate shape for a microphone, the use of aircraft wings to shield the community from engine noise, the reflection of engine noise from an aircraft fuselage, and the radiation of trailing edge noise. K.L.

N80-14871# Centre National de la Recherche Scientifique, Marseilles (France). Dept. of Acoustics.
RANDOM PROPAGATION AND RANDOM SCATTERING
C. Gazanhes *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 11 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The treatment of random propagation problems using geometrical optics, the Born approximation, the Rytov method, and parabolic equations is reviewed. The case of scattering by a cloud of random scatters is considered. K.L.

N80-14872# Centre National de la Recherche Scientifique, Marseilles (France). Dept. of Acoustics.
UNDERWATER ACOUSTIC PROBLEMS
C. Gazanhes *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 9 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

Basic principles which simplify underwater acoustics problems are reviewed. A static description of the medium is given, transmission loss is defined, and the effects of fluctuations in the medium on acoustical transmission are discussed. Propagation problems are considered from the ray and mode point of view. K.L.

N80-14873*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Inst. for Computer Application in Science and Engineering.
EXPERIMENTAL AND NUMERICAL RESULTS OF SOUND SCATTERING BY A BODY
L. Maestrello and A. Bayliss *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 12 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01 CSCL 20A

The interaction of aerodynamic noise with a fuselage shaped body is discussed. A numerical technique is presented which permits the computation of the scattering of an acoustic source by a body at rest for frequencies of aeroacoustic interest. A parallel experiment is described which confirms the results of the computations. A numerical study of varying the geometry of the scattering is presented. In addition, the effect of forward motion on the mean velocity and static pressure profiles in the wake of such a body with a jet exiting from it is simulated. Experimental results are presented and a similarity law is given. K.L.

N80-14874# Technical Univ. of Denmark, Lyngby. Acoustics Lab.
FINITE-AMPLITUDE WAVE PROPAGATION
Leif Bjorno *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 15 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The historical development of finite amplitude wave propagation in fluids is reviewed. The theoretical basis for the propagation of plane, cylindrical, or spherical finite amplitude waves through lossless, thermoviscous, or relaxing fluids is presented and characteristic features of the distortion course observed by finite amplitude waves in various regions of propagation are emphasized. Some experimental procedures and results are mentioned. K.L.

N80-14875# Technical Univ. of Denmark, Lyngby. Acoustics Lab.
NONLINEAR INTERACTION OF FINITE-AMPLITUDE SOUND WAVES
Leif Bjorno *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 10 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The history and the fundamental theory of nonlinear interaction of finite amplitude sound waves is reviewed and the concept of parametric acoustic arrays is introduced. Low amplitude wave interactions in absorption and spreading-loss limited parametric transmitting arrays are discussed for continuous and pulsed primaries and for field points outside or inside the interaction region. High amplitude wave interactions leading to nearfield saturation limited parametric transmitting arrays are further treated for field points outside and inside the interaction region. The parametric receiving array for low and high amplitude pump waves is discussed and possibilities for obtaining an improvement of the parametric conversion efficiency for low and high amplitude wave interactions are given. K.L.

N80-14876# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Experimentelle Stroemungsmechanik.
AEROACOUSTIC MEASURING TECHNIQUES IN OR OUTSIDE TURBULENT FLOWS
Helmut V. Fuchs *In* AGARD Special Course on Acoustic Wave Propagation Aug. 1979 27 p refs (For primary document see N80-14858 05-71)
Avail: NTIS HC A10/MF A01

The motion of aerodynamic or acoustic sources relative to the fluid and/or the measuring instrument is discussed. Some practically important effects on the pressure and velocity fields in and outside the active source region are deduced from linearized wave equations with simple source functions. Limitations on fluctuating aerodynamic and acoustic pressure measuring techniques employing special microphone probes are discussed. Applications include: (1) the pressure pulsations induced in the near fields of jet, wake, and duct flows; and (2) the effects of source convection and forward speed on the far field radiation characteristics of jets or other aeroacoustic sources in motion. K.L.

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-14877* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH RESOLUTION THRESHOLD PHOTOELECTRON SPECTROSCOPY BY ELECTRON ATTACHMENT Patent
Ara Chutjian (JPL) and Joseph M. Ajello, inventors (to NASA) (JPL) Issued 19 Jun. 1979 6 p Filed 30 Nov. 1977 Supersedes N78-13917 (16 - 04, p 0546)
(NASA-Case-NPO-14078-1; US-Patent-4,158,775; US-Patent-Appl-SN-856466; US-Patent-Class-250-423P; US-Patent-Class-250-281; US-Patent-Class-250-282) Avail: US Patent and Trademark Office CSCL 20H

A system is provided for determining the stable energy levels of a species ion, of an atomic, molecular, or radical type, by application of ionizing energy of a predetermined level, such as through photoionization. The system adds a trapping gas to the gaseous species to provide a technique for detection of the energy levels. The electrons emitted from ionized species are captured by the trapping gas, only if the electrons have substantially zero kinetic energy. If the electrons have nearly zero energy, they are absorbed by the trapping gas to produce negative ions of the trapping gas that can be detected by a mass spectrometer. The applied energies (i.e. light frequencies) at which large quantities of trapping gas ions are detected, are the stable energy levels of the positive ion of the species. SF6 and CFCl3 have the narrowest acceptance bands, so that when they are used as the trapping gas, they bind electrons only when the electrons have very close to zero kinetic energy.
Official Gazette of the U.S. Patent and Trademark Office

N80-14878*# Williams Coll., Williamstown, Mass.
EFFECTS OF HYDROGEN ATOM SPIN EXCHANGE COLLISIONS ON ATOMIC HYDROGEN MASER OSCILLATION FREQUENCY Final Technical Report, 1 Dec. 1977 - 30 Nov. 1979
Stuart B. Crampton 1979 15 p refs
(Grant NsG-5218)
(NASA-CR-162525) Avail: NTIS HC A02/MF A01 CSCL 20H

Frequency shifts due to collisions between hydrogen atoms in an atomic hydrogen maser frequency standard are studied. Investigations of frequency shifts proportional to the spin exchange frequency shift cross section and those proportional to the duration of exchange collisions are discussed. The feasibility of operating a hydrogen frequency standard at liquid helium temperatures is examined. A.W.H.

N80-14879*# Xavier Univ. of Louisiana, New Orleans. Dept. of Physics/Pre-Engineering.
CALCULATION OF TOTAL CROSS SECTIONS FOR CHARGE EXCHANGE IN MOLECULAR COLLISIONS Final Report
Juliette Ioup 31 Dec. 1979 32 p refs
(Grant NsG-1361)
(NASA-CR-162560) Avail: NTIS HC A03/MF A01 CSCL 20H

Areas of investigation summarized include nitrogen ion-nitrogen molecule collisions; molecular collisions with surfaces; molecular identification from analysis of cracking patterns of selected gases; computer modelling of a quadrupole mass spectrometer; study of space charge in a quadrupole; transmission of the 127 deg cylindrical electrostatic analyzer; and mass spectrometer data deconvolution. A.R.H.

N80-14880# Washington Univ., Seattle. Dept. of Chemistry.
COLLISIONAL RELAXATION OF TRANSIENT VIBRATIONAL ENERGY DISTRIBUTIONS IN A THERMAL UNIMOLECULAR SYSTEM: THE VARIABLE ENCOUNTER METHOD
D. F. Kelley, L. Zalotai, and B. S. Rabinovitch 15 Sep. 1979 42 p refs Submitted for publication Sponsored in part by NSF
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A074163; TR-011) Avail: NTIS HC A03/MF A01 CSCL 07/3

The Variable Encounter Method is described in detail together with theoretical modes for deconvolution of data. A relation is developed between mean first passage time and 'incubation' time. Application is made to the study of the transient region in vibrational accommodation of cyclopropane-d2 at high temperature surfaces. Collision efficiency declines with rise of temperature. Surface collisions are more efficient than binary gas phase encounters. GRA

N80-14881# New York Univ., N. Y. Dept. of Physics.
THEORETICAL STUDIES RELATING TO THE INTERACTION OF RADIATION WITH MATTER: ATOMIC COLLISION PROCESSES OCCURRING IN THE PRESENCE OF RADIATION FIELDS Annual Report, 1 Aug. 1978 - 31 Jul. 1979
P. R. Berman 15 Aug. 1979 9 p refs
(Contract N00014-77-C-0553)
(AD-A074183; AR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

Work is reported in the areas of: collisional studies using laser spectroscopy; the nature and validity of collision kernels; strong field effects in laser spectroscopy; collisionally-aided radiative excitation, including a model potential calculation; radiative collisions including model potential calculations; collisional studies using photon echoes or Optical Ramsey Fringes; photon echoes produced by standing-wave fields; and photoionization by pulsed laser fields. GRA

N80-14882# Wisconsin Univ. - Madison. Dept. of Physics.
MOLECULAR REACTION RATES Final Report, 1 Aug. 1973 - 30 Sep. 1978
Chun C. Lin and Sunggi Chung 30 Oct. 1978 115 p refs
(Contract F19628-73-C-0274; AF Proj. 2310)
(AD-A073851; AFGL-TR-78-0262) Avail: NTIS HC A06/MF A01 CSCL 07/4

Theoretical excitation/dissociation cross sections of H2 molecule by electron impact have been calculated by Born approximation and by the method of close-coupling. The ab initio calculations have been facilitated by using the Gaussian-type orbital technique. In the case of dissociation of O2 via the Schumann-Runge system, the theoretical calculations are based on the multiconfiguration self-consistent-field wave functions. GRA

N80-14883# California Univ., Livermore. Lawrence Livermore Lab.
SOME DOUBLE RESONANCE AND MULTIPLE QUANTUM NMR STUDIES IN SOLIDS Ph.D. Thesis
D. E. Wemmer Aug. 1978 295 p refs
(Contract W-7405-eng-48)
(LBL-8042) Avail: NTIS HC A13/MF A01

The theory and experimental applications to analysis of molecular motion of chemical shielding lineshapes obtained with high resolution double resonance NMR techniques are presented. Analysis of C-13 powder lineshapes in hexamethylbenzene and decamethylferrocene show that these molecules reorient in a jumping manner about the symmetry axis. Analysis of proton chemical shielding lineshapes of residual protons in heavy ice show that protons are exchanged among the tetrahedral positions of neighboring oxygen atoms, consistent with motion expected from defect migration. The application of Fourier transform double quantum NMR to measurement of chemical shielding of deuterium in powder samples is described. The general multiple quantum spectroscopy in dipolar coupled spin systems is discussed. Theoretical description is made for creation and detection of coherences between states without quantum number selection rules. Descriptions of techniques for partial selectivity of order in preparation and detection of multiple quantum coherences are made. The effects on selectivity and resolution of echo pulses during multiple quantum experiments are discussed. DOE

N80-14884# Columbia Univ., New York. Dept. of Physics.
ORDERING OF ATOMIC ENERGY LEVELS IN EXCITED STATES
H. M. Foley 1978 13 p refs
(Contract EY-76-C-02-2271)
(CU-TP-135) Avail: NTIS HC A02/MF A01

A consistent odering of excited atomic states with the

quantity k = n + 1, for small values of the orbital angular momentum 1, pointed out by Sternheimer is examined. The ordering is interpreted in terms of the variation of the quantum defects with 1. The simple rules for the k ordering are given. The reasons for the observed variation of the quantum defects are understood in terms of the accumulation of zero energy scattering phase shifts with 1 and with zeta, as calculated from a realistic atomic potential. DOE

NBO-14885/ California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CATALYSIS AND SURFACE SCIENCE
G. A. Somorjai Mar. 1979 55 p Presented at European Conf. on Surface Sci., 2, Cambridge, England, 26 Mar. 1979
(Contract W-7405-eng-48)
(LBL-9043; CONF-790356-2) Avail: NTIS HC A04/MF A01

The dynamics of the elementary surface reaction steps on the atomic scale and the relationship of the atomic surface structure and surface composition to the catalytic process are reviewed. The surface science techniques employed and the special instrumentation developed to couple the low pressure environment necessary for the application of these techniques and the high pressure conditions utilized in catalysis are discussed. The model studies using well characterized surfaces are discussed in relation to the importance of surface irregularities and surface additives in controlling the rate and the product distribution in the surface reactions. Research topics reviewed include: (1) the atomic scale investigation of proven catalytic systems, (2) studies of catalyst deactivation and poisoning, and (3) attempts to build new catalysts. DOE

NBO-14886/ California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
PHOTODISSOCIATION PROCESSES IN MOLECULAR BEAMS Ph.D. Thesis
L. R. Carlson May 1979 145 p refs
(Contract W-7405-eng-48)
(LBL-9219) Avail: NTIS HC A07/MF A01

Photo-fragmentation translational spectroscopy was utilized to observe the photodissociation dynamics of ozone. Using a supersonic molecular beam and a 10 nanosecond pulsed laser at lambda = 266 nm, the velocities of the fragment products are measured by the method of time of flight. The resolution of the time of flight spectrum of ozone is sufficiently high that the electronic and vibrational states are clearly resolved and identified. The quantum yield for the production of O (1 D) above the threshold (1 lambda < 310 nm) is discussed. Energy distributions are compared with photodissociation models along with the polarization dependence of the dissociative process which was also measured. DOE

NBO-14887/ California Univ., Livermore. Lawrence Livermore Lab.
FORMATION OF HYDROGEN NEGATIVE IONS BY SURFACE AND VOLUME PROCESSES WITH APPLICATION TO NEGATIVE ION SOURCES
J. R. Hiskes 27 Jun. 1979 43 p refs Presented at 15th Intern. Conf. on Phenomena in Ionized Gases, Grenoble, France, 9-13 Jul. 1979
(Contract W-7405-eng-48)
(UCRL-82889; CONF-790708-3) Avail: NTIS HC A02/MF A01

The need for negative ions as a means for generating high energy neutral beams is discussed. Methods for generating negative ion beams which, in the past, have relied upon synchrotron concepts are reviewed. The requirements for magnetic fusion are presented. Proposed source modules would accelerate an order of 10 A of beam current and deliver several megawatts of beam power. Both hydrogen and deuterium ion beams are considered for application in different reactor systems. Proposals for development of negative ion beams are discussed. These are: the double charge exchange method for converting a positive ion beam into a negative ion beam; the electron volume processes wherein low energy electrons interacting with molecular species lead to negative ion products via dissociative attachment or recombination; and third, generation of negative ions in surface interactions, principally via desorption and backscattering. DOE

NBO-14888/ California Inst. of Tech., Pasadena.
CAPTURE OF MUONS IN ATOMS
P. Vogel 1978 34 p refs Presented at Nordic Spring Symp. on Inner Shell Phenomena, Geilo, Norway, 17 Apr. 1978
(Contract EY-76-C-03-0068)
(CALT-63-304; CONF-7804144-1) Avail: NTIS HC A03/MF A01

The theoretical framework is described for the formation of mesic atom and the initial part of the atomic cascade. The observable phenomena are reported and the mechanics are discussed. DOE

NBO-14889/ Argonne National Lab., Ill.
INTERACTION OF FAST MOLECULAR IONS WITH MATTER
D. S. Gemmell 1979 14 p refs Presented at 6th Intern. Congr. Symp. on Radiation Res. and Stem Cells, Tokyo, 13 May 1979
(Contract W-31-109-eng-38)
(CONF-790524-8) Avail: NTIS HC A02/MF A01

The interactions of fast ions with matter are discussed using molecular ion projectiles. At high velocities, these projectiles dissociate rapidly upon entering a solid, resulting in a tight cluster of fragments which continue into the solid closely correlated in space and in time. High resolution studies on the trajectories of such fragments, the energy losses, the shifts in angle and energy and the charge states, are discussed in terms such as stopping power, radiation damage, and the interactions of fast ions with the plasma oscillations they induce in solids. DOE

NBO-14890/ Brookhaven National Lab., Upton, N. Y.
HIGH RESOLUTION MAGNETIC SPECTROMETER FOR ANTIPROTON PHYSICS AT REST AND LOW ENERGIES
D. I. Lowenstein, D. C. Peaslee (DOE, Washington, D.C.), R. A. Lewis (Michigan State Univ.), R. Miller (Michigan State Univ.), B. Y. Oh (Michigan State Univ.), M. Pratap (Michigan State Univ.), G. A. Smith (Michigan State Univ.), J. Whitmore (Michigan State Univ.), T. Brando (Syracuse Univ.), T. E. Kalogeropoulos (Syracuse Univ.) et al 1978 14 p refs Presented at 4th European Anti-Proton Symp., Strasbourg, 26 Jun. 1978
(Contract EY-76-C-02-0016)
(BNL-24662; CONF-7806108-1) Avail: NTIS HC A02/MF A01

The principles and details of the spectrometer being installed in a high intensity antiproton beam are presented. TOF scintillation counters which will measure particle and gamma ray energies with high resolution, as well as identify particles, are described. The spectrometer is being installed to look for peaks in the gamma spectra coming from annihilations at rest by converting them in a thin radiator before a magnet. The question of gamma excess in antinucleon-nucleon annihilations at rest and the ability of the spectrometer to study the annihilations is discussed.
A.W.H.

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

NBO-14891/ Rome Air Development Center, Griffiss AFB, N.Y.
GAMMA ENERGY SPECTRA FOR THE RADC/ES COBALT 60 SOURCE Interim Report
A. R. Frederickson Apr. 1979 23 p refs
(AD-A073557; RADC-TR-79-68) Avail: NTIS HC A02/MF A01 CSCL 20/8

A Monte Carlo photon transport code has been used to calculate the photon energy distributions produced by several in-use intense CO60 sources at RADC/ES (formerly at AFCRL). In addition, the energy-angle spectra has been determined for photons exiting collimators used with these sources. These spectra may be helpful in understanding the responses of devices and materials irradiated by the source photons. GRA

N80-14892# Naval Surface Weapons Center, White Oak, Md.
RIGID-ROTOR EQUILIBRIUM OF INTENSE RELATIVISTIC ELECTRON BEAM Final Report
Han S. Uhm 15 Mar. 1979 73 p refs
(ZR00001; ZR01109)
(AD-A073318; NSWC/WOL/TR-78-182) Avail: NTIS HC A04/MF A01 CSCL 20/8

Understanding of the equilibrium properties of intense relativistic electron beams is extremely important in various areas, including microwave generation and beam propagation in the atmosphere. This report examines the equilibrium properties of the intense relativistic electron beam described by the rigid-rotor equilibrium distribution function. Beam properties including an axial velocity profile, a beam temperature, a beam density, and equilibrium self-field profiles are calculated for a broad range of system parameters. GRA

N80-14893# Los Alamos Scientific Lab., N. Mex.
MISSIONS AND PLANNING FOR NUCLEAR SPACE POWER
D. Buden 1979 7 p refs Presented at 14th Intersoc. Energy Conversion Conf., Boston, 5 Aug. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1240; CONF-790803-06) Avail: NTIS HC A02/MF A01

Requirements for electrical and propulsion power for space are discussed. Nuclear power is examined as a source for some deep space missions and a major competitor for many orbital missions, especially those at geosynchronous orbit. A technology program on reactor components is evaluated. The missions that are foreseen, the current reactor concept, and the technology program plan are described. DOE

N80-14894# Department of Energy, Washington, D. C. Div. of Nuclear Power Development.
NUCLEAR POWER PROGRAM INFORMATION AND DATA: UPDATE, MARCH - APRIL 1979
1979 153 p refs
(DOE/TIC-10119) Avail: NTIS HC A08/MF A01

Information on nuclear power development, nuclear power plant construction, and nuclear power plant operation is presented. The economics of nuclear power and the fuel requirements and performance of nuclear generating units are discussed. The NRC review of the Three Mile Island accident is presented. A.W.H.

N80-14895# Maryland Univ., College Park. Dept. of Physics and Astronomy.
PION NUCLEON INTERACTION AT LOW ENERGY
Manoj K. Banerjee Mar. 1979 10 p refs Presented at 2d Intern. Conf. on Meson-Nucl. Phys., Houston, Tex., 5 Mar. 1979
(Contract EY-76-S-05-5126)
(ORO-5126-60; CONF-790347-10; PT-79-066; TR-79-076; PP-79-165) Avail: NTIS HC A02/MF A01

A theory of the pion nucleon interaction at low energy is described. An analogy is made with an unusual approach to potential scattering theory. Phase shifts, cross sections, and scattering amplitudes and lengths are calculated. DOE

N80-14896# Columbia Univ., New York. Dept. of Physics.
HIGH ENERGY HADRON-NUCLEUS COLLISIONS
A. H. Mueller 1978 6 p refs
(Contract EY-76-C-02-2271)
(CU-TP-137) Avail: NTIS HC A02/MF A01

The forward elastic scattering of a hadron of momentum p off a nucleus of radius R is studied. It is concluded that the parton wave function of a fast hadron is far from being a short range correlated object in rapidity even in the intermediate mass range. Both the parton approach and the more formal arguments without understanding a detailed space-time description are considered. The AKG cutting rules which tie the parton theory with the formal Pomeron exchange description are discussed. DOE

N80-14897# Brookhaven National Lab., Upton, N. Y.
SUPERCONDUCTING MAGNETS IN HIGH ENERGY PHYSICS
A. G. Prodell 1978 29 p refs Presented at Instr. Soc. of Am. Meeting, Philadelphia, 16 Oct. 1978
(Contract EY-76-C-02-0016)
(BNL-24818; CONF-781025-3) Avail: NTIS HC A03/MF A01

The applications of superconducting magnets in high energy physics are discussed. These developments which include high magnetic field, large volume detectors, such as bubble chambers, required for effective resolution of high energy particle trajectories, particle beam transport magnets, and superconducting focusing and bending magnets for the very high energy accelerators and storage rings are examined. Some of the superconducting magnets and associated systems being used in and being developed for high energy physics are described. DOE

74 OPTICS

Includes light phenomena.

N80-14898 Utah Univ., Salt Lake City.
IMAGING IN A FABRY-PEROT INTERFEROMETER Ph.D. Thesis
Douglas Harry Ulmer 1979 180 p
Avail: Univ. Microfilms Order No. 7927898

The propagation of millimeter wave (MMW) and optical images through a Fabry-Perot interferometer (FPI) as well as the electric field enhancing effects inside the FPI are investigated. It was proposed that images, whose electric field distributions are strengthened in an FPI, might be used to modulate laser light in 43 m crystals using the electrooptic effect to make MMW images visible. The properties of the degree to which an image passes through an FPI undisturbed and of the degree to which the fields are enhanced are examined. The behavior of images passing through an FPI was shown to be the transmission of discrete spatial frequencies corresponding to the approximate modes. An expression was derived which details the spatial frequency passage of the FPI. The construction of a MMW FPI at 140 GHz and the subsequent measurement of the quality of the passage of images through it is discussed. Dissert. Abstr.

N80-14899 Carnegie-Mellon Univ., Pittsburgh, Pa.
A STUDY ON SELECTED WIDEBAND GUIDED-WAVE ACOUSTOOPTIC AND ELECTROOPTIC DEVICES Ph.D. Thesis
Bumman Kim 1979 192 p
Avail: Univ. Microfilms Order No. 7919147

Guided wave acoustooptic (A-O) interactions and devices, and an electrooptic switching/coupling device are described. In guided wave acoustooptic interaction, guided optical beams and surface acoustic waves (SAW) are employed and LiNbO3 was used as an interaction medium. Guided modes in a graded index medium were analyzed using the method of multiple scale. The SAW in LiNbO3 was also reviewed. Bragg diffraction of guided waves in LiNbO3 was analyzed in detail using the coupled mode technique. Dissert. Abstr.

N80-14900*# Arkansas Univ., Fayetteville. Dept. of Physics.
SCALABLE STANDARD OPTICAL SOURCES IN THE VUV: EMISSIONS FROM ELECTRON IMPACT ON METALS Final Report
Ray Hughes Jan. 1980 12 p refs
(Grant NsG-7106)
(NASA-CR-162562) Avail: NTIS HC A02/MF A01 CSCL 20F

The use of electron impact on metals in the development of a compact optical standard lamp in the vacuum ultraviolet is described. Two different mechanisms are exploited, transition radiation and bremsstrahlung. Transition radiation will be used as a primary standard from 1200A to 3000A using 10 keV electron impact on tungsten. Bremsstrahlung will be used in the soft X-ray region below 1200A to less than 5A as an optical transfer standard from 4 keV electron impact on tantalum or tungsten. A.R.H.

N80-14901# Optical Sciences Co., Placentia, Calif.
ANALYSIS OF TECHNIQUES FOR IMAGING THROUGH THE ATMOSPHERE Final Technical Report, Nov. 1978 - Apr. 1979

David L. Fried Griffiss AFB, N.Y. RADC, Griffiss AFB, N.Y. Jul. 1979 96 p refs
(Contract F30602-77-C-0021; ARPA Order 2646)
(AD-A073640; R-138; RADC-TR-79-190) Avail: NTIS HC A05/MF A01 CSCL 20/6

This report is concerned with the application of speckle imagery to space object identification for deep space objects. A novel type of variable Michelson Stellar Interferometer setup for forming speckle image data is described. Also, the theory of noise in speckle imagery is developed on a rigorous basis. This report is the final technical report on this contract. GRA

N80-14902# Naval Research Lab., Washington, D. C.
THE FUNDAMENTALS OF THERMAL IMAGING SYSTEMS Interim Report
John B. Goodell, George L. Harvey, ed., Walter W. Lawson, James A. Ratches, Robert E. Roberts, Fred A. Rosell, ed., Robert L. Sendall, and David L. Schumaker 10 May 1979 263 p refs
(NRL Proj. N01-29; ZF323910)
(AD-A073763; AD-E000318; NRL-8311; EOTPO-46) Avail: NTIS HC A12/MF A01 CSCL 17/5

The purpose of this book is to provide the reader with a document which brings together under one cover an overview of radiometric and photometric concepts involved in thermal imaging systems. Governing equations are derived from simple fundamental concepts. Also, models used for the visual discrimination i.e., detection, recognition, or identification, of real scene objects are discussed. It is hoped that the text will be useful to FLIR designers, evaluators, and thermal imaging system modelers, as well as those whose sole interest is a grasp of the concepts involved in thermal imaging. GRA

N80-14903# Rockwell International Science Center, Thousand Oaks, Calif.
DEVELOPMENT OF CHARGE TRANSFER DEVICES FOR 1-2 MICRON IMAGING Final Report, 10 May 1977 - 9 Dec. 1978
Ira Deyhimy Dec. 1978 65 p refs
(Contract DAAK70-77-C-0109)
(AD-A074653; SC5111.16FR) Avail: NTIS HC A04/MF A01 CSCL 17/5

There is considerable interest in the development of an imaging system within the wavelength range of 1.0 - 1.8 micrometers. The concept of charge coupled devices emerges as one of the viable candidates for such an application. The advantages of a non-MIS, Schottky barrier, buried channel CCD are discussed. A suitable material system for the 1.0 - 1.8 micrometer CCD application is the n-GaAlSb/p+-GaSb hetero-system. Substantially improved surface morphology for this system is reported. This is achieved by the addition of As to the AlGaSb layer, thus forming the quaternary: GaAlAsSb. Characterization of Schottky barriers to this material are reported. The Schottky barrier height is found to be = 0.7eV. GRA

N80-14904# Naval Research Lab., Washington, D. C. Electro-Optical Technology Program Office.
PASSING INFRARED SURVEILLANCE - NEW METHODS OF ANALYSIS Interim Report
Richard A. Steinberg 24 Sep. 1979 168 p refs
(AD-A074742; EOTPO-55; NRL-MR-4078) Avail: NTIS HC A08/MF A01 CSCL 17/5

A new theoretical procedure is presented for calculating the performance of scanning background-limited (BLIP) infrared sensors with adaptive threshold signal processing logic. The performance predictions obtained with this model are background-conditional, i.e., are valid only for a given infrared background scene, presumably specified as a radiance map of arbitrary (but deterministic) structure. The non-stationary statistical nature of the photocurrent is explicitly taken into account. The basic approach involves a combination of some results from optical communications theory with a formalism for the threshold-crossing statistics of nonstationary noises, originally developed by Rice, Cramer, and Leadbetter. GRA

N80-14905# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
INFRARED MEASUREMENTS OF VEHICLES AND WEAPONS Final Report
18 Jul. 1979 26 p Supersedes MTP-2-2-812
(AD-A074487; TOP-2-2-812; MTP-2-2-812) Avail: NTIS HC A03/MF A01 CSCL 17/5

Techniques and instrumentation methods are described for measuring infrared (IR) radiation during development and production tests of military ground vehicles and weapons. The report covers measurements of IR signatures of vehicles and IR temperature measurements of weapon tubes during firing programs. Pertinent areas/surfaces/conditions for survey and sample plots, graphs, and photographs for reporting results are included. Tests are applicable to those conducted on land. GRA

N80-14906# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
AN ALGEBRAIC MODEL OF ADAPTIVE OPTICS FOR CONTINUOUS-WAVE THERMAL BLOOMING
Cynthia Whitney Jan. 1979 60 p refs
(Contract DAAK40-78-C-0117)
(AD-A074741; R-1235) Avail: NTIS HC A04/MF A01 CSCL 20/6

This paper presents a simple algebraic model for a continuous-wave laser beam delivered on target with spreading due to both random and deterministic phase aberrations. The number of deterministic Zernike mode phase aberrations included are sufficient to give a realistic representation for thermal blooming. The aberrations modeled generally include those applied by an adaptive optics system to compensate the naturally occurring ones. For the random phase aberrations, compensation is a linear process the net result of which is a simple scaling down. By contrast, the thermal-blooming aberrations are complicated nonlinear functions of the applied compensations. Consequently, for this case, the interaction of applied and natural aberrations must be modeled in detail. The model shows that sometimes conventional adaptive optics concepts can produce counter-intuitive and very disappointing results when applied to thermal blooming. However, the analysis suggests novel remedies that will tend to optimize the corrections made, thus better realizing the full potential of adaptive optics. GRA

N80-14907# Edgerton, Germeshausen and Grier, Inc., Los Alamos, N. Mex. Energy Measurement Group.
THICK FILM FIBER OPTICS TO INTEGRATED OPTICS INTERFACE
I. Aeby 1979 6 p refs Presented at SPIE, Washington, D.C., 17 Apr. 1979
(Contract EY-76-C-08-1183)
(EGG-1183-5104; CONF-790448-1) Avail: NTIS HC A02/MF A01

Thick film optical waveguides integrated with mechanical fiber optics connectors on a single substrate are considered. Micron alignment accuracies made possible by photolithographically fabricating the mechanical fiber guides in the same medium as the optical waveguides allow efficient coupling of light from optical fibers to the thick film light guides. Coupling losses of less than 1 dB are experimentally verified. Mass producibility, low cost, and flexibility of design make these integrated optics very useful as fiber optics connectors and splitters as well as fiber optics to integrated optics interfaces. DOE

N80-14908# Addis Translations International, Portola Valley, Calif.
ULTRA-RAPID ELECTROOPTICAL ANGULAR DEFLECTOR OPERATING IN THE NANOSECOND RANGE: APPLICATIONS
M. Blanchet, J. C. Dupont, E. Bazelaire, J. P. Chambaret, and M. Franco 1978 12 p refs Presented at the Congr. on High Speed Photography and Photonics, Tokyo, 20 Aug. 1978
(UCRL-Trans-11428; CONF-780804-14-Trans) Avail: NTIS HC A02/MF A01

An angular deflector consisting of a set of electro-optical prisms immersed in an index fluid operating in the vicinity of the Curie temperature was devised. The device makes it possible to obtain a deflection of one degree at an angular speed of one degree per nanosecond with a dynamic resolution of the order of 25 points. DOE

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-14909 Texas Univ. at Austin.
A MULTIPLE SPECIES ION ENERGY ANALYZER APPLIED TO LASER-INDUCED PLASMA EXPERIMENTS
Ph.D. Thesis
Sangkoo Francisco Hahn 1979 122 p
Avail: Univ. Microfilms Order No. 7928297

A mass spectrometer which employs parallel electric and magnetic fields in combination with an array of collectors and accompanying electronic circuits was developed to measure the energy distributions of several different ion species generated by irradiating a pulsed ruby laser on a LiH target surface. This device has an array of simple integrating charge collectors situated in the same plane as the entrance aperture, and the electric and magnetic fields are set parallel to this collector plane. Ions complete one-half of a helical trajectory before being collected. The collectors are arranged so that each row collects ions of a given mass-to-charge ratio, while each column of a row preserves energy per charge information of the ions detected. The separation of ion species into rows and their energies into columns leads to an automatic interpretation of the resulting data.
Dissert. Abstr.

N80-14910# Nagoya Univ. (Japan). Inst. of Plasma Physics.
INVERSE METHOD FOR THE MIXED NONLINEAR SCHROEDINGER EQUATION AND SOLITON SOLUTIONS
T. Kawata, J. Sakai, and N. Kobayashi Sep. 1979 35 p refs
(IPPJ-417) Avail: NTIS HC A03/MF A01

A mixed nonlinear Schroedinger equation which has a usual cubic nonlinear term and a derivative cubic nonlinear term is exactly solved by the inverse scattering method under the nonvanishing boundary condition. The N-soliton solution is obtained and we find that the one-soliton solution generally pulsates but becomes stationary and further algebraic in some special cases. Both limiting cases corresponding to the nonlinear Schroedinger equation and the derivative nonlinear Schroedinger equation are made clear. This problem is applied to solve the Alfven wave, propagating parallel to the magnetic field, under the plane wave boundary condition. A peculiar structure of spiky modulation is shown analytically.
Author

N80-14911# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ION HEATING BY THE CURRENT-DRIVEN TURBULENCE IN AN INHOMOGENEOUS PLASMA
Kouzi Matsunaga Oct. 1979 35 p refs
(IPPJ-423) Avail: NTIS HC A03/MF A01

Basic experiments of turbulent heating are performed in a non-isothermal and inhomogeneous plasma. A high frequency drift wave (HFDW) is excited by the parallel electron current. From detailed measurements of the ion energy distribution, it is found that ions are heated isotropically and nonlocally. The ion heating is always accompanied with the large amplitude HFDW turbulence. The ion heating rate can be well explained by the semi-phenomenological quasi-linear stochastic heating theory.
Author

N80-14912# Nagoya Univ. (Japan). Inst. of Plasma Physics.
POST COLLISION INTERACTION IN PHOTOEXCITED ARGON LMM AUGER PROCESSES
H. Hanashiro (Tokyo Univ.), Y. Suzuki (Tokyo Univ.), A. Mikuni (Tokyo Univ.), T. Sasaki (Tokyo Univ.), T. Takayanagi (Sophia Univ.), K. Wakiya (Sophia Univ.), H. Suzuki (Sophia Univ.), A. Danjo (Niigata Univ.), S. Ohtani, and T. Hino Sep. 1979 13 p refs
(IPPJ-422) Avail: NTIS HC A02/MF A01

The L(2),(3)M(23)M(23) Auger-electron spectra of argon produced by photoionization were studied. The range of photon energy is from 249 eV, just above the L(3) edge, to 270 eV. The closer the photon energy is to the threshold, the more conspicuously is the post-collision interaction observed as a shift of the peak and asymmetric profile in each Auger line. The observed dependence of the energy shift upon the kinetic energy of the photoelectron is compared with the semi-classical theory after Niehaus, and the mean lifetime for Auger decay of the inner-shell hole is deduced to be 2.4 x 10 to the -14th power sec.
Author

N80-14913# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ENHANCEMENT OF D-T REACTION RATE DUE TO D-T CONTACT
Shigehisa Hitoki, Masatada Ogasawara, and Osamu Aono Sep. 1979 29 p refs
(IPPJ-419) Avail: NTIS HC A03/MF A01

The reaction rate that is appropriate for magnetized nonuniform plasma is numerically calculated to investigate the enhancement of the D-T reaction rate. Spatial separation of the guiding center distributions of D and T which enhances the reaction rate is discussed. Cases of several guiding center configurations are investigated. The largest enhancement is obtained when both guiding center distributions are delta functions which are separated by a length that corresponds to the Gamow peak energy. Cases of the guiding center distributions with finite widths are also investigated.
A.W.H.

N80-14914# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STABILITY OF HIGH DENSITY PLASMA IN A MULTIPLE MIRROR
M. Inutake, A. Komori (Tohoku Univ., Sendai, Japan), R. Hatakeyama (Tohoku Univ., Sendai, Japan), and N. Sato (Tohoku Univ., Sendai, Japan) Jul. 1979 6 p refs
(IPPJ-418) Avail: NTIS HC A02/MF A01

Confinement and stability for a low beta plasma in a multiple mirror were investigated by using Q machines. Measurements were also made on gun produced and theta pinch plasmas with high beta value. Characteristic behaviors of low frequency plasma instabilities are discussed using a quasi steady, high density, helium plasma.
A.W.H.

N80-14915# Nagoya Univ. (Japan). Inst. of Plasma Physics.
INVESTIGATION OF MOLYBDENUM IMPURITY DIFFUSION DURING HYDROGEN GAS PUFFING IN JIPP T-11 PLASMA
M. Sato, R. Sugihara, and K. Miyamoto Oct. 1979 28 p refs
(IPPJ-412) Avail: NTIS HC A03/MF A01

In JIPP T-2 Tokamak plasma, a decrease of molybdenum density in the plasma center was observed by soft X-ray measurement during the strong gas puffing. A model based on the neoclassical concept in the Pfirsch-Schloeter regime is presented to explain the decrement. The model indicates that the combination of a decrement of inward flux in the plasma center region and an increment of outward flux causes the decrement of the central molybdenum ion density.
A.W.H.

N80-14916# Nagoya Univ. (Japan). Dept. of Electrical Engineering.
NONLINEAR SHIFT OF RESONANCE VELOCITY IN INTERACTIONS BETWEEN PARTICLES AND PLASMA CYCLOTRON WAVES
K. Ido Sep. 1979 14 p refs
(IPPJ-421) Avail: NTIS HC A02/MF A01

Two types of wave-particle interactions are clarified in finite-amplitude cyclotron waves (whistler, electron cyclotron, and ion cyclotron waves). Further, the wave nonlinearity was found to cause the shift of cyclotron resonance velocity from the linear value, (omega - Omega sub o) /K, where Omega sub o denotes the cyclotron frequency. The effect of this shift on the wave propagation is suggested.
Author

N80-14917# Nagoya Univ. (Japan). Inst. of Plasma Physics.
NONADIABATIC ENERGY TRANSFER BETWEEN COUPLED L-C RESONATORS AND ITS POSSIBLE APPLICATIONS TO HIGH-POWER RF PULSE GENERATION
Ikken Sato (Tokyo Inst. of Technology, Japan), Kazuo Minami (Tokyo Inst. of Technology, Japan), and Kazushige Ishii Sep. 1979 53 p refs
(IPPJ-32) Avail: NTIS HC A04/MF A01

A principle of high-power RF pulse generation available in nuclear fusion research is proposed. The RF energy stored in L-C resonators with variable resonant frequencies is transferred to a load resonator when the frequency crossing occurs. Successive

energy transfers from resonators result in a sustained RF oscillation at the load. It is emphasized that the successive triggering is not required in the present method. This simplifies substantially the operation of the RF generators. The principle is analyzed and numerically calculated for practical experimental conditions. An example of the conceptual designs of the variable inductor used in the present method is shown. At the frequency 1 MHz (4 MHZ), the output 110 kW (440 kW) and the pulse width 24 sec (6 micron sec) are expected, if one uses tow toroidal ferrite cores with a major radius 0.5m and a minor radius 0.2m. Author

N80-14918# Nagoya Univ. (Japan). Inst. of Plasma Physics.
SUPER-BANANA LIMITER AS A POSSIBLE EDGE COOLING SCHEME
K. Ikuta and M. Okamoto Nov. 1979 11 p refs
(IPPJ-425) Avail: NTIS HC A02/MF A01

An edge cooling scheme is proposed where energetic impurity atoms are injected into the plasma periphery in which the ripple of toroidal field is vertically asymmetric. By the asymmetric ripple, the injected impurity ion forms a super-banana which drifts outward to the wall, enhancing the radiation cooling in the plasma periphery without impurity accumulation. The impurity beam is thus called a super-banana limiter. Author

N80-14919# Nagoya Univ. (Japan). Inst. of Plasma Physics.
BEHAVIOUR OF LASER-PRODUCED PLASMA IN A UNIFORM MAGNETIC FIELD: PLASMA INSTABILITIES
Shigefumi Okada, Kohnosuke Sato, and Tadashi Sekiguchi Nov. 1979 34 p refs
(IPPJ-424) Avail: NTIS HC A03/MF A01

The production of a column of a laser produced plasma successfully made in a uniform magnetic field is described. The radius of the column increases and then decreases. On the surface of this plasma column, where the steep density gradient exists with the scale length shorter than the ion Larmor radius, an azimuthal modulation appears in the plasma luminosity. This is indicative of the flute like instability with the azimuthal wave number. The dispersion equation based on the linearized Vlasov equation with the local approximation is derived and the occurrence of the lower hybrid drift instability is predicted. A.W.H.

N80-14920# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ELECTRON SPECTRA RESULTING FROM AUTOIONIZATION IN LOW-ENERGY Li(+) + He COLLISIONS
A. Yagishita, K. Wakiya, T. Takayanagi, H. Suzuki, F. Koike, and S. Ohtani Sep. 1979 55 p refs
(IPPJ-420) Avail: NTIS HC A04/MF A01

Spectra of electrons ejected from doubly excited states of helium were extensively measured at several observation angles of impact with lithium ions at energies lower than 5 keV. 'Molecular-autoionization' spectra were found at forward observation angles, and analyzed in terms of the Gerber-Niehaus theory with modification. The spectral shapes of atomic-autoioniztion peaks are discussed in relation to both the Barker-Berry effect and the Doppler effect. Excitation cross sections of autoionizing states are determined by a method that uses simultaneous impact of ions and electrons. Author

N80-14921*# United Technologies Research Center, East Hartford, Conn.
HIGH TEMPERATURE UF6 RF PLASMA EXPERIMENTS APPLICABLE TO URANIUM PLASMA CORE REACTORS
Ward C. Roman Oct. 1979 101 p refs
(Contract NAS1-14329)
(NASA-CR-159159) Avail: NTIS HC A06/MF A01 CSCL 20I

An investigation was conducted using a 1.2 MW RF induction heater facility to aid in developing the technology necessary for designing a self critical fissioning uranium plasma core reactor. Pure, high temperature uranium hexafluoride (UF6) was injected into an argon fluid mechanically confined, steady state, RF heated plasma while employing different exhaust systems and diagnostic techniques to simulate and investigate some potential characteristics of uranium plasma core nuclear reactors. The development of techniques and equipment for fluid mechanical confinement of RF heated uranium plasmas with a high density of uranium vapor within the plasma, while simultaneously minimizing deposition of uranium and uranium compounds on the test chamber peripheral wall, endwall surfaces, and primary exhaust ducts, is discussed. The material tests and handling techniques suitable for use with high temperature, high pressure, gaseous UF6 are described and the development of complementary diagnostic instrumentation and measurement techniques to characterize the uranium plasma, effluent exhaust gases, and residue deposited on the test chamber and exhaust system components is reported. A.W.H.

N80-14922*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF VELOCITY OVERSHOOT ON THE PERFORMANCE OF MAGNETOHYDRODYNAMIC SUBSONIC DIFFUSERS
Mahesh S. Greywall (Wichita State Univ.) and J. Marlin Smith 1980 10 p refs Presented at Aerospace Sci. Meeting, Pasadena, Calif., 14-16 Jan. 1980; Sponsored by AIAA
(Contract EF-77-A-01-2674)
(NASA-TM-79305; DOE/NASA/2674-79/8; E-257) Avail: NTIS HC A02/MF A01 CSCL 20I

The evolution of an overshoot velocity distribution was studied in a plane two dimensional diffuser as a function of diffuser divergence angle. The diffuser performance for velocity overshoot was compared to that for a fully developed inlet velocity profile. Results indicate that the ratio of peak-to-center line velocity increases along the diffuser for a diffuser half angle greater than some critical value. It was also found that irrespective of the accompanying inlet temperature distribution, the wall shear stress and the wall heat flux is substantially larger when the inlet velocity profile has an overshoot than that for a fully developed inlet velocity profile. R.C.T.

N80-14923*# Colorado State Univ., Fort Collins. Dept. of Physics.
INTERACTION OF HIGH VOLTAGE SURFACES WITH THE SPACE PLASMA Annual Report
Harold R. Kaufman and Raymond S. Robinson May 1979 81 p refs
(Grant NsG-3196)
(NASA-CR-159731) Avail: NTIS HC A05/MF A01 CSCL 20I

Tests were conducted using plasma densities of approximately 10 to the 5th power - 10 to the 6th power/cu cm. Insulating materials tested were polyimide (Dapton), mica and glass. Surface-area effects were found to be substantially reduced from those previously reported at lower plasma densities. The difference in typical plasma density was felt to be the major cause of this change, although a saturation effect may also be involved. At the 10 to the 5th power/cu cm plasma density range, surface effects on collection current appear limited to roughly 1 cm from the hole. A factor of several reduction of collected current was obtained with both surface scribing and a 2 x 2 cm conducting mesh. It appears possible that the effects of surface treatment might be more significant at lower plasma densities. Effects of repeated tests were also noted, with current collection decreasing with successive tests. Depending on the materials involved, the effect appeared due to either the smoothing of the inside of the insulator hole or the sputtering of insulator on the exposed conductor. A general conclusion was made from a variety of observations, that the generation of vapor is a major factor in the enhancement of collected current. A.R.H.

N80-14924# Oak Ridge National Lab., Tenn. Fusion Energy Div.
VERY SMALL ASPECT RATIO TOKAMAKS
Y. K. M. Peng and R. A. Dory 1978 47 p refs
(Contract W-7405-eng-26)
(CONF-780811-32) Avail: NTIS HC A03/MF A01

Tokamak experiments which achieved good plasma confinement and high temperatures are discussed. Conceptual design studies of Tokamak fusion reactors based on extrapolation of conventional values of plasma parameters are examined. Magnetohydrodynamic stability analyses for Tokamak equilibria are discussed. The effects of strong toroidicity on Tokamak currents driven by neutral beam ions, bootstrap effects, and net rf momentum are reported. Comparisons of the very small aspect

ratio Tokamaks with other magnetic fusion concepts, such as the relativistic electron ring and the field reversed theta pinch, are presented. A.W.H.

N80-14925# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
SOFT X-RAY MEASUREMENTS FOR INVESTIGATING PLASMA FOCUS DYNAMICS
B. Nahrath 1978 80 p refs In GERMAN; ENGLISH summary
(IPF-78-1) Avail: NTIS HC A05/MF A01

In a Mather-type plasma focus, short time soft X-ray pictures were taken to study the local development of electron temperature with a time resolution of 3 nanoseconds. The measured electron temperatures were roughly in accordance with the results of magnetohydrodynamic calculations up to maximum compression. During a later phase, characterized by the occurrence of m=0 instabilities, localized plasma regions with high densities and high electron temperatures of about 600 eV were observed. A slowly decaying plasma with local electron temperature values of about 300 eV and large diffuse structures was identified for several hundred nanoseconds. During this 'late phase' of the focus most of the neutron emission takes place. There is no correlation between the value of electron temperature and the rate of neutron emission. Author (ESA)

N80-14926# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
MEASUREMENT OF THE ION PROFILE BY STATIONARY CO2 LASER SCATTERING FROM A HYDROGEN PLASMA
H. Hailer 1978 93 p refs In GERMAN; ENGLISH summary
(IPF-78-5) Avail: NTIS HC A05/MF A01

Collective laser light scattering with a cw CO2 laser is applied to a magnetically stabilized hydrogen arc. In the experimental geometry (theta = 90 deg, lambda = 10.6 microns) the scattering parameter is alpha = 7. With a laser power of 160 W and a Ge:Hg detector NEP of 60 pico W/(sq. root of Hz), sufficient signal to noise ratios are achieved using lock in techniques. Spectral resolution is performed by pressure scanning with a Fabry-Perot spectrometer with Ge plates. The measured ion profiles agree with theory for a thermal plasma. Values for the ion temperatures are obtained. Author (ESA)

N80-14927# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
NON-AXIAL-SYMMETRIC ALFVEN WAVES IN CYLINDRICAL, RADIAL INHOMOGENEOUS PLASMAS
E. Raeuchle Aug. 1978 44 p refs In GERMAN; ENGLISH summary
(IPF-78-6) Avail: NTIS HC A03/MF A01

The propagation of nonaxisymmetric Alfven waves is investigated theoretically. Eigenfunctions and dispersion relations are calculated numerically for radial inhomogeneous cylindrical plasmas. Resistivity, neutral particle loading, and ion cyclotron effects are included in the magnetohydrodynamic treatment. The investigations are of importance for plasma heating by Alfven waves. Author (ESA)

N80-14928# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
LIGHT SCATTERING FROM AN ARC PLASMA WITH STATIONARY CO2 LASER AND HETERODYNE DETECTION
J. H. Massing 1978 67 p refs In GERMAN; ENGLISH summary
(IPF-78-8) Avail: NTIS HC A04/MF A01

Collective high scattering experiments with IR lasers on fusion oriented plasmas using optical heterodyne detection are discussed. Heterodyne detection is combined with a modulation technique to improve the receiver sensitivity in the experiment. The scattering arrangement was applied to a hydrogen arc plasma. With a power of less than 20 W for the stationary CO2 laser, thermal density fluctuations were recorded with a 20 sec duration of measurement. The spectra obtained with a scattering angle of 38 mrad is discussed in relation to theory. Author (ESA)

N80-14929# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
ANOMALOUS ELECTRON THERMAL CONDUCTIVITY ACROSS DESTROYED MAGNETIC SURFACES
A. A. Galeev and L. M. Zeleny 1979 20 p refs
(PR-501) Avail: NTIS HC A02/MF A01

A plasma slab model is discussed, in which the magnetic surfaces are parallel to the plane YZ, presenting sheared magnetic field lines in the presence of magnetic fluctuations perpendicular to the undisturbed magnetic surfaces. The magnetic fluctuations are assumed to be quasistatic, for which a restriction is imposed on the frequency of the fluctuations. The velocity of the cross-field transport of electrons due to these fluctuations is determined, showing that the calculated coefficient corresponds to the cross-field anomalous electron thermal conductivity. A new semicollisional regime of anomalous thermal conductivity is described, being an intermediate state between the collisionless and hydrodynamic regimes. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N80-14930 Virginia Univ., Charlottesville.
EXPERIMENTAL STUDIES OF METAL-AMMONIA SOLUTIONS; RAMAN SCATTERING AND SUSCEPTIBILITY Ph.D. Thesis
Peter James Osina 1978 261 p
Avail: Univ. Microfilms Order No. 7928029

Two experiments performed on metal-ammonia solutions are described in this dissertation. A description of the solvent is given with reasons why metals might be expected to dissolve in ammonia. The discovery and early work on metal-ammonia solutions is traced and a number of their important properties are enumerated with various models reviewed. The first experiment describes an attempt to Raman scatter from dilute solutions of sodium, potassium, and calcium in ammonia to test the cavity model of the solvated electron. No scattering center attributed to the solvated electron was found nor were the ammonia Raman bands altered by the presence of the solute. The second experiment deals with report of superconductivity in sodium ammonia solutions frozen quickly (quenched) in liquid nitrogen (77 K) or liquid oxygen (90 K). The use of two SQUID susceptometers and their operation is described. Static susceptibility measurements for the temperature range 1.2 to 300 K are presented for liquid helium (1.2 to 4.2 K), vitreous quartz, sodium, ammonia (liquid and solid), and sodium-ammonia solutions. Dissert. Abstr.

N80-14931 Minnesota Univ., Minneapolis.
HEAT CAPACITY OF AMORPHOUS AND DISORDERED Nb3Ge THIN FILMS Ph.D. Thesis
Navalgund Anant Hemant Kumar Rao 1979 194 p
Avail: Univ. Microfilms Order No. 7926162

Heat capacity measurements on 1000 - 1500 A thick amorphous Nb3Ge and granular Al films were carried out using an ac technique in order to study the effect of thermal fluctuations, both above and below the superconducting transition temperature T sub c, in dirty, short meanfree path materials. Since only changes in the heat capacity near T sub c were wanted, no attempt was made to determine the absolute value of the heat capacity of the film. By carrying out a consistent fit to the data both above and below T sub c, the thermodynamic transition temperature T sub BCS was determined. By subtracting the extrapolated value of the fit from the measured heat capacity, close to T sub BCS, the excess heat capacity both above and below T sub BCS which represents deviations from the mean field behavior could also be determined. Low temperature resistivity measurements on some dilute Pd(Fe) alloy films are also discussed. Dissert. Abstr.

N80-14932 Virginia Univ., Charlottesville.
DYNAMIC DISLOCATION PHENOMENA IN SINGLE CRYSTALS OF ALPHA-PHASE BINARY AND TERNARY COPPER ALLOYS Ph.D. Thesis
Sudipta Kumar Ray 1979 234 p
Avail: Univ. Microfilms Order No. 7928004

Single crystals of Cu-x-at.%-Ni-x-at.%-Pd and Cu-x-at.%-Pd alloys (x = 1 to 6), were deformed in tension at 300 K and 4.2 K. All the crystals had the /331/ ((-1)10) ((-1)(-1)6) orientation which has two equivalent ((-1)(-1)1) <011> and <111> and <101> primary glide systems. With the Cu-Ni-Pd alloy single crystals significant source hardening with reduced frictional resistance to dislocation motion was attained. This is due to the compensating effects of the size and modulus contributions to solute hardening. The Cu-Pd alloys also exhibited extensive source hardening. The concentration dependence of the critical resolved shear stress (CRSS) at the yield point for both the alloy series was given by a linear relation of the form CRSS (T K) = A(T) + B(T) c(alpha) where A and B are constants for one alloy series at a temperature of T K and c is the total solute concentration in atomic percent. Dissert. Abstr.

N80-14933 Purdue Univ., Lafayette, Ind.
MICROWAVE MAGNETOPLASMA EFFECTS IN SEMICONDUCTOR POWERS AND ARRAYS OF SPHERES Ph.D. Thesis
Jean Ellen Sansonetti 1979 148 p
Avail: Univ. Microfilms Order No. 7926426

Microwave interactions with powdered semiconductors and arrays of semiconductor spheres were investigated. The electrical transport properties of the bulk material and the general problem of electromagnetic wave interactions with particulate samples were examined. Three distinct, but closely related investigations are presented. (1) The dielectric constant of silicon powders at 35 GHz as a function of magnetic field, temperature, and resistivity were investigated. The dependence of the powder dielectric constant upon the dielectric constant of the grains of power was analyzed. (2) The interaction of microwaves with powders made from semiconductors containing paramagnetic ions was studied. The dependence of the electron paramagnetic resonance line shape upon such factors as the grain size and the constitutive parameters of the grain material was emphasized. The interparticle interactions within clusters of spherical InSb grains were examined. Dissert. Abstr.

N80-14934 Washington Univ., Seattle.
ORDERING TRANSITIONS IN HELIUM-4 SUBMONOLAYERS: A HEAT CAPACITY STUDY Ph.D. Thesis
Manu Jamnadas Tejwani 1979 203 p
Avail: Univ. Microfilms Order No. 7927877

The heat capacity of several submonolayer He-4 films absorbed on bare graphite foam and on krypton plated graphite foam were measured at temperatures from 1 to 4.2 K. A model calculation using a tight binding formalism is presented, aimed at understanding the comparative effect of various rare gas platings on the low density helium specific heat. The substrates are described by a single parameter. For various values of this parameter, the second virial contribution to the helium specific heat is calculated and compared with experimental data. Dissert. Abstr.

N80-14935 Polytechnic Inst. of New York.
EXPERIMENTAL DETERMINATION OF THE PHASES OF X-RAY REFLECTIONS Ph.D. Thesis
Po-wen Wang 1979 115 p
Avail: Univ. Microfilms Order No. 7920805

In general, the phases of individual X-ray reflections from single crystals can not be determined experimentally from measurements of the intensities in conventional two-beam diffraction. It is readily shown that the phase is lost in such diffraction. This dissertation is divided into two major portions. The first is concerned with the detailed calculations of the values of various physical quantities such as dispersion surface, absorption and excitation for selected triplets of reflections, for the positive and negative phases. The second aspect is concerned primarily with the experimental investigation of the indicated phase relationships and the possible extension of Post's work to four-beam and higher order cases. The phases of several groups of reflections from germanium and aluminum oxide single crystals were determined. Dissert. Abstr.

N80-14936 Rice Univ., Houston, Tex.
THE USE OF RESONANCE EPITHERMAL NEUTRON SCATTERING FOR THE STUDY OF CONDENSED MATTER Ph.D. Thesis
Robert Earl Wood 1979 137 p
Avail: Univ. Microfilms Order No. 7919646

Resonant epithermal neutron scattering studies provide a new regime for the study of the properties of condensed matter. The differential scattering cross section is developed in a resonant correlation function formalism involving the positions of two scattering centers at four different times. The resonant correlation functions contain information which cannot be obtained from a study of the Van Hove correlation functions for thermal neutron scattering, and these resonant correlation functions enable one to observe phenomena which are beyond the scope of thermal neutron scattering. It is shown that the lowest order correction to the short collision time limit yields a force density correlation function. Resonant neutron scattering provides a means of determining the amplitudes of specific anharmonic phonon interactions of cubic order. When this method is turned to the study of diffusion, higher order diffusive propagators are obtained which give the conditional probabilities for diffusion over two distinct intervals of time. Using the resonant selection of virtual excited states enables the diffusion of molecules in definite states of vibrational excitation to be observed. Dissert. Abstr.

N80-14937 California Univ., Los Angeles.
THE ELECTRON-PHONON INTERACTION SPECTRUM IN PROXIMITY EFFECT COPPER Ph.D. Thesis
Jerry Allen Wilson 1979 128 p
Avail: Univ. Microfilms Order No. 7926075

The electron-phonon interaction spectrum in non-superconducting metals was determined from measurements of the single electron density of states. The density of states is measured by tunneling into the N side of a proximity effect junction. The extremely powerful gap inversion algorithm developed by W. L. McMillian for superconductive tunneling is extended, applied to Cu and Ag. This gives directly the unitless electron-phonon coupling constant for Cu and Ag as .12 and .11 respectively. The results of the calculation are given and compared and to similar quantities determined for superconductors. The computer program and a conversion table to tie the computer variables of the physical parameters are included. The format of the input data is also discussed. Dissert. Abstr.

N80-14938 Oklahoma State Univ., Stillwater.
LASER TIME-RESOLVED SITE SELECTIONS SPECTROSCOPY OF Nd3+ IONS IN MIXED GARNET CRYSTALS Ph.D. Thesis
Masud Zokai 1979 132 p
Avail: Univ. Microfilms Order No. 7928247

The effects of mixed crystal host on the spectra of Nd(3+) ions were investigated and energy transfer among Nd(3+) ions in various garnet crystals was characterized at low and high temperatures. The techniques of site-selection and time-resolved spectroscopy were used. The mixed crystal nature of the host was found to produce both distinct structure and inhomogeneous broadening in the Nd(3+) spectra. The migration and trapping processes require thermal activation and the temperature dependence of the transfer is consistent with a two-photon assisted process. The efficiency of energy transfer was found to be greater in mixed crystals than in unmixed garnet hosts, and it is shown that this is associated with the increase in the transition matrix elements in the mixed crystals. Dissert. Abstr.

N80-14939 Maryland Univ., College Park.
THE IONIZATION AND NEUTRALIZATION OF SPUTTERED ATOMS Ph.D. Thesis
Theodore Ralph Lundquist 1979 122 p
Avail: Univ. Microfilms Order No. 7926532

The mechanisms for ionization or neutralization of sputtered atoms was observed to be related to both the electronic density of states at the surface and the local chemical bonding. Various theoretical models are discussed in regard to their ability to predict the dependence of this probability on the energy of the sputtered atoms. To obtain this dependence, the energy distributions of both the sputtered neutrals and ions were measured. The dependence on chemical bonding was investigated by measuring the ion energy distributions for different oxygen exposures. The ionization probabilities were found to increase with the energy of the sputtered atoms. A.W.H.

N80-14940# Stanford Univ., Calif.
QUANTUM FIELD THEORY METHODS APPLIED TO THE PHYSICS OF CONDENSED MATTER Final Report, 1 Nov. 1975 - 31 Mar. 1979
S. Doniach 9 Aug. 1979 12 p refs
(Grant DAAG29-76-G-0053)
(AD-A073509; ARO-13422.1-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

This report summarizes briefly research performed under the grant. A complete list of Ph.D.'s awarded and associated researchers working with total or partial support is included. The report contains a full list of publications resulting from the research. GRA

N80-14941*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXTENDED SOFT-CUBE MODEL FOR THE THERMAL ACCOMMODATION OF GAS ATOMS ON SOLID SURFACES
John R. Burke and D. J. Hollenbach Jan. 1980 61 p refs
Prepared in cooperation with San Francisco State Univ.
(NASA-TM-81163; A-8047) Avail: NTIS HC A04/MF A01 CSCL 20K

A numerical soft cube model was developed for calculating thermal accommodation coefficients alpha and trapping fractions f sub t for the interaction of gases incident upon solid surfaces. A semiempirical correction factor c which allows the calculation of alpha and f sub t when the collision times are long compared to the surface oscillator period were introduced. The processes of trapping, evaporation, and detailed balancing were discussed. The numerical method was designed to treat economically and with moderate (+ or - 20 percent) accuracy the dependence of alpha and f sub t on finite and different surface and gas temperatures for a large number of gas/surface combinations. Comparison was made with experiments of rare gases on tungsten and on alkalis, as well as one astrophysical case of H2 on graphite. The dependence of alpha on the soft cube dimensionless parameters is presented graphically. R.C.T.

N80-14942# Stanford Univ., Calif. Center for Materials Research.
THE PREPARATION AND CHARACTERIZATION OF InP AND RELATED 3-5 SINGLE CRYSTALS AND EPITAXIAL LAYERS PRODUCED BY MOLTEN SALT ELECTROLYSIS Final Report, 1 Mar. 1977 - 30 Apr. 1979
Robert S. Feigelson, Richard H. Bube, and Dennis Elwell Jun. 1979 36 p refs
(Grant DAAG29-77-G-0109)
(AD-A073421; SU-CMR-79-4; ARO-14210.1-MS) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report summarizes the results of a two-year investigation of the viability of electrodeposition as a means of preparing indium phosphide, ultimately for electronic device applications. InP proved to be a difficult material to prepare by this technique, mainly because of the restrictions imposed on the maximum temperature of deposition by decomposition of InP and volatilization of In2O3 solute. A major portion of the total effort was spent on finding an optimum solvent to meet the requirement that the maximum deposition temperature should not exceed 600 C, and the Na,K/PO3,F quaternary eutectic was found to give best results. Reproducible InP deposits of fairly uniform thickness were made onto (0001) single crystal CdS substrates at potentials of -0.90 to 1.00V (versus graphite) with current densities of 1-3mA/sq cm. In spite of these low current densities, deposits thicker than 1 micron were found to be polycrystalline. The purity of the deposits was not sufficiently high for device applications, but a marked improvement with length of deposition time was demonstrated. Deposits of InP on (111) InP substrates were also polycrystalline and of less uniform thickness. GRA

N80-14943# University of Southern California, Los Angeles. Electronic Sciences Lab.
GROWTH AND CHARACTERIZATION OF EPITAXIAL PIEZOELECTRIC AND SEMICONDUCTOR FILMS Final Report, 1 Mar. 1977 - 31 May 1979
K. M. Lakin and S. K. Tiku Jul. 1979 40 p refs
(Grant AF-AFOSR-3235-77; AF Proj. 2306)
(AD-A073813; AFOSR-79-0954TR) Avail: NTIS HC A03/MF A01 CSCL 20/2

This report includes the details of research work on this two-year project on the growth and characterization of thin films for piezoelectric applications. The report covers the results on A1N and ZnO growth by the metal-organic process. The problems associated with the A1N on sapphire system have been discussed. In the case of ZnO films, low temperature CVD system (DEZ/H2O and DEZ/CO2) have been developed. It is seen that the films grown by the DEZ/CO2 system do not need any post-growth diffusion, as the as-grown resistivity is quite high. GRA

N80-14944# ARO, Inc., Arnold Air Force Station, Tenn.
IR OPTICAL PROPERTIES OF THIN H2O, NH3, AND CO2 CRYOFILMS Final Report, 1 Oct. 1977 - 15 Mar. 1979
J. A. Boux, B. E. Wood, and A. M. Smith AEDC Sep. 1979 110 p refs
(AD-A074913; AEDC-TR-79-57) Avail: NTIS HC A06/MF A01 CSCL 09/2

The infrared spectral transmittance of cryofilms formed by H2O, NH3, CO2, and mixtures of these constituents in an N2 matrix were measured. These 0.25 to 14 micrometer thick films were cryopumped onto 20 and 77 K germanium substrates; the deposition pressure for the films deposited at 20 K and that for the 77 K films was approximately 2 times 10 to the minus 6 torr. Transmission spectra were obtained for the 500 to 1/3,700 cm wave number range with a Fourier transform spectrometer. Values of the complex index of refraction for the H2O, NH3, and CO2 cryodeposits were derived from the experimental data using an analytical model and the nonlinear least-squares method. The analytical model treats the germanium as a thick noninterfering film and the deposit as a thin film. Results from the least-squares method are compared with a Kramers-Kronig determination of the real part of the index of refraction. The optical properties (n, k) of such cryofilms are essential for predicting the degradation of contaminated cryocooled optical surfaces. GRA

N80-14945# Michigan Univ., Ann Arbor. Electron Physics Lab.
ELECTRICAL COMPENSATION IN InP PRODUCED BY BACKGROUND IMPURITIES AND STRUCTURAL DEFECTS Final Report
B. L. Mattes Aug. 1979 32 p refs
(Contract N00019-78-C-0406)
(AD-A074178) Avail: NTIS HC A03/MF A01 CSCL 20/2

Liquid phase epitaxial layers of InP have been grown at 475 C by a steady-state growth technique that maintains the substrate at a constant temperature. The growth system has excellent temperature control, fast thermal response, uniform temperature profiles and up to 50 degrees of C/cm temperature gradients that can be induced normal to the substrate. To achieve uniform nucleation on InP substrates at these low temperatures, a submersed-displacement cleaning procedure was developed that uses a dilute HCl-methanol etch to remove oxides. The initial layers were discontinuous and had poor electrical properties due to oxide contamination in the In-melt and to substrate oxidation during the heat-up cycle. New in and the covering of the substrate with InP during heat-up appears to have solved this problem. Thermodynamic models of the growth system indicate that the graphite growth cell increases the decomposition of fused quartz and introduces C, O and Si into the In-melt. GRA

N80-14946# Battelle Columbus Labs., Ohio.
INFLUENCE OF STOICHIOMETRY ON IMPINGEMENT EROSION OF LEAD SULFIDE AND ZINC SELENIDE Final Report, 1 Jun. 1978 - 30 Apr. 1979
R. G. Hoagland and I. G. Wright 14 Aug. 1979 18 p refs
(Grant AF-AFOSR-3283-77; AF Proj. 2306)
(AD-A073955; AFOSR-79-0959TR) Avail: NTIS HC A02/MF A01 CSCL 20/2

The results of a series of water droplet impingement erosion experiments on lead sulfide and zinc selenide are described. The work with single crystal lead sulfide sought to correlate the mechanisms of surface damage with mechanical strength, lead sulfide affording an opportunity to study the effect of a range of hardness, caused by a shift in stoichiometry into the p-type

range, in specimens otherwise similar in elastic properties and pre-existing dislocation substructures. Dislocations involved in the deformation resulting from water droplet impacts were revealed by etch pitting. The size and nature of the impact sites on all the lead sulfide specimens studied, using 0.42 mm water droplets impacting at 100-168 m/s, were found to be in fact highly stochastic. The deformation produced was strongly dependent upon the pre-existing arrangement of dislocations at the impact site, and considerable effort was expended in obtaining suitably dislocation-free crystal surfaces. The polycrystalline zinc selenide examined is a prime candidate material for windows for IR imaging devices. The grain boundaries in this material appeared to act as flaw sites which, upon repeated impact, led to the encirclement of complete grains by cracks, with consequent material loss.
GRA

N80-14947# Massachusetts Inst. of Tech., Cambridge.
GRAIN BOUNDARY STRUCTURE AND PROPERTIES
R. W. Balluffi May 1979 20 p refs
(Contract ER-78-S-02-5002)
(COO-5002-3) Avail: NTIS HC A02/MF A01

The properties of grain boundaries which are relevant to the problem of the time dependent fracture of high temperature structural materials are examined. These include the basic phenomena associated with cavitation and cracking at grain boundaries during service and with the more general microstructural changes which occur during both processing and service. The current state of knowledge of these fundamentals is reviewed.
DOE

N80-14948# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
DIFFUSION INDUCED GRAIN BOUNDARY MIGRATION
J. W. Cahn (NBS, Washington, D.C.), J. D. Pan, and R. W. Balluffi May 1979 8 p refs
(Contract ER-78-S-02-5002; Grant NSF DMR-76-20662)
(COO-5002-2) Avail: NTIS HC A02/MF A01

Evidence that diffusion itself can induce boundary migration is reviewed. Experiments documenting this fact using zinc-iron alloys are discussed. The relationship of grain boundaries with bulk composition change due to boundary migration is examined.
A.W.H.

N80-14949# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
DIFFUSIONAL MASS TRANSPORT IN POLYCRYSTALS CONTAINING STATIONARY OR MIGRATING GRAIN BOUNDARIES
J. W. Cahn (NBS, Washington, D.C.) and R. W. Balluffi May 1979 5 p refs
(Contract ER-78-S-02-5002; Grant NSF DMR-76-20662)
(COO-5002-1) Avail: NTIS HC A02/MF A01

Regimes of diffusion transport behavior which exist in a polycrystalline material are classified taking into account the possibility that the grain boundaries are either stationary or migrating. The increase of mass transport in polycrystalline materials by diffusion along grain boundaries is discussed. The temperature effects on lattice diffusion rates is examined. The effect of migrating grain boundaries during diffusion is discussed.
A.W.H.

N80-14950# Stanford Linear Accelerator Center, Calif.
TOPICS IN THE QCD PHENOMENOLOGY OF DEEP-INELASTIC SCATTERING
L. F. Abbott Mar. 1979 12 p refs Presented at Orbis Scientiae 1979 Conf., Coral Gables, Fla., 15 Jan. 1979
(Contract EY-76-C-03-0515)
(SLAC-PUB-2296; CONF-790150-4) Avail: NTIS HC A02/MF A01

The status of QCD with respect to recent results from deep inelastic neutrino scattering is described. The theoretical uncertainties coming from effects of nonleading order in 1/sq Q and in alpha sub s is emphasized.
DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

N80-14951 Texas Univ. at Austin.
VACUUM POLARIZATION IN CURVED SPACETIME Ph.D. Thesis
Richard Walter Guy 1979 106 p
Avail: Univ. Microfilms Order No. 7928296

The stress tensor is determined by utilizing the zeta-function method of regularization and renormalization. The form of the renormalized stress tensor is first tested in various examples of flat spacetimes. It is shown to vanish in Minkowski space and to yield the accepted value of the energy density in the Casimir effect. Next, the stress tensor is calculated in two spacetimes of constant curvature, the Einstein universe and the deSitter universe, and the results are shown to agree with those given by an expression of the stress tensor that is valid in conformally flat spacetimes. The stress tensor is determined on the horizon of a Schwarzschild black hole by approximating the radial part of the eigenfunctions and the metric in the vicinity of the horizon. The stress tensor at this level of approximation is found to be pure trace. The approximated forms of the Schwarzschild metric describes a conformally flat spacetime that possesses horizons.
Dissert. Abstr.

N80-14952# California Univ., Berkeley. Lawrence Berkeley Lab.
STATISTICAL MECHANICS AND FIELD THEORY
S. A. Samuel May 1979 339 p refs
(Contract W-7405-eng-48)
(LBL-9168) Avail: NTIS HC A15/MF A01

Field theory methods are applied to statistical mechanics. Statistical systems are related to fermionic-like field theories through a path integral presentation. Considered are the Ising model, the free-fermion model, and close-packed dimer problems on various lattices. Graphical calculational techniques are developed. They are powerful and yield a simple procedure to compute the vacuum expectation value of an arbitrary product of Ising spin variables. From a field theorist's point of view, this is the simplest, most logical derivation of the Ising model partition function and correlation functions. By the above methods a model named the 128 pseudo-free vertex model is solved. Statistical mechanics intuition is applied to field theories. It is shown that certain relativistics field theories are equivalent to classical interacting gases. Using this analogy many results are obtained, particulary for the Sine-Gordon field theory. Quark confinement is considered.
DOE

N80-14953# Iowa State Univ. of Science and Technology, Ames. Dept. of Materials Science and Engineering.
ANALYSIS OF THE THERMODYNAMICS AND PHASE RELATIONSHIPS OF A PORTION OF THE VANADIUM-OXYGEN SYSTEM
J. F. Smith 1979 10 p refs Presented at the Calculations of Phase Diagrams Calphad Meeting, Stockholm, 21 May 1979 Prepared in cooperation with Ames Lab.
(Contract W-7405-eng-82)
(IS-M-212; CONF-790506-1) Avail: NTIS HC A02/MF A01

The thermodynamics and phase equilibria in the vanadium-oxygen system are examined. An assimulation of the data is made to generate a self consistent set of Gibbs energy functions to describe the known details of the phase equilibria in order to predict the unknown details. An initial assessment of data for the congruently melting phases and the development of composition dependent Gibbs functions for beta V02 and for oxygen rich liquid is described.
DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N80-14954# Argonne National Lab., Ill.
DISTRIBUTION AND CLASSIFICATION OF LOCAL SOCIO-ECONOMIC IMPACTS FROM ENERGY DEVELOPMENT
D. J. Santini and D. W. South 1979 20 p refs Presented at the 2nd Ann. Conf. on the Small City and Regional Community, Stevens Point, Wis., 15 Apr. 1979
(Contract W-31-109-eng-38)
(CONF-790481-1) Avail: NTIS HC A02/MF A01

Present and proposed energy facility siting patterns are examined and their socio-economic impact is assessed. Results show that: (1) new electric capacity will shift from oil and gas to coal and nuclear fuels; (2) coal and nuclear plants require more labor per megawatt than oil and gas plants; (3) coal and nuclear plants are larger than gas or oil plants; (4) new coal and nuclear plants will be larger than such existing plants; (5) among regions, greater shares of energy production will occur in those regions less able to assimilate employment growth; and (6) within regions, greater shares of energy production will occur in counties less able to assimilate employment growth. These results clearly demonstrate that socio-economic impact from energy development will be greater in the future than in the past. DOE

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N80-14955*# Information Planning Associates, Inc., Gaithersburg, Md.
FUNCTIONAL DESIGN SPECIFICATION: NASA FORM 1510 Final report
15 Nov. 1979 99 p
(NASA-CR-162513) Avail: NTIS HC A05/MF A01 CSCL 05A

The 1510 worksheet used to calculate approved facility project cost estimates is explained. Topics covered include data base considerations, program structure, relationship of the 1510 form to the 1509 form, and functions which the application must perform: WHATIF, TENENTER, TENTYPE, and data base utilities. A sample NASA form 1510 printout and a 1510 data dictionary are presented in the appendices along with the cost adjustment table, the floppy disk index, and methods for generating the calculated values (TENCALC) and for calculating cost adjustment (CONSTADJ). Storage requirements are given. A.R.H.

N80-14956*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
USER REQUIREMENTS FOR A PATIENT SCHEDULING SYSTEM
W. Zimmerman 1 Dec. 1979 73 p refs
(Contract NAS7-100)
(NASA-CR-162539; JPL-Pub-79-119) Avail: NTIS HC A04/MF A01 CSCL 05A

A rehabilitation institute's needs and wants from a scheduling system were established by (1) studying the existing scheduling system and the variables that affect patient scheduling, (2) conducting a human-factors study to establish the human interfaces that affect patients' meeting prescribed therapy schedules, and (3) developing and administering a questionnaire to the staff which pertains to the various interface problems in order to identify staff requirements to minimize scheduling problems and other factors that may limit the effectiveness of any new scheduling system. A.R.H.

N80-14957# Army Concepts Analysis Agency, Bethesda, Md.
MANAGEMENT ANALYSIS OF KEY RESOURCE OPERATIONS (MAKRO). VOLUME 1 Final Report
Frank A. Distasio, Jr., George E. Armstrong, Samuel K. Wasaff, Jr., and Samuel M. Burney, Jr. 30 Mar. 1979 242 p refs 3 Vol.
(AD-A069016; CAA-SR-79-6-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 05/1

The MAKRO study analyzes the planning, programming, and budget formulation phases of Army PPBS and suggests ways to improve the system. The principal PPBS Activities at HQDA were identified, then subjected to rigorous analysis, and documented. The methodology included development and implementation of a computer-based graphics routine to create network diagrams. Network diagrams were constructed for 21 distinct Army PPBS processes that were identified in the analysis. The network diagrams are published separately. Specific prescriptive measures were nominated to improve certain PPBS processes. The paramount MAKRO study insight is that the Army PPBS is responsive to higher authorities at the expense of time for rigorous analysis. The study presents two alternatives which singly or together could enhance the quality of analysis supporting army PPBS: (1) seek relief from the highly interactive/reactive dialogue with higher echelons that is conducted particularly during programming and budgeting; and (2) expand the scope of planning to provide more detail of resource sensitive issues for use in programming. Author (GRA)

N80-14958# Army Concepts Analysis Agency, Bethesda, Md.
MANAGEMENT ANALYSIS OF KEY RESOURCE OPERATIONS (MAKRO). VOLUME 2, APPENDIX E: NETWORKS. ANNEXES 1 AND 2: PLANNING AND PROGRAMMING Final Report
Frank A. Distasio, Jr., George E. Armstrong, Samuel K. Wasaff, Jr., and Samuel M. Burney, Jr. 30 Mar. 1979 375 p 3 Vol.
(AD-A069017; CAA-SR-79-6-Vol-2-App-E-Ann-1) Avail: NTIS HC A16/MF A01 CSCL 05/1

Planning and programming network diagrams constructed for 21 distinct Army Planning, Programming, and Budgeting System processes are presented. J.M.S.

N80-14959# Army Concepts Analysis Agency, Bethesda, Md.
MANAGEMENT ANALYSIS OF KEY RESOURCE OPERATIONS (MAKRO). VOLUME 3, APPENDIX E: NETWORKS. ANNEX 3: BUDGET FORMULATION Final Report
Frank A. Distasio, Jr., George E. Armstrong, Samuel K. Wasaff, Jr., and Samuel M. Burney, Jr. 30 Mar. 1979 329 p 3 Vol.
(AD-A069018; CAA-SR-79-6-Vol-3-App-E-Ann-3) Avail: NTIS HC A15/MF A01 CSCL 05/1

Budget formulation diagrams constructed for Army Planning, Programming, and Budgeting processes are presented. J.M.S.

N80-14960# Martin Marietta Aerospace, Orlando, Fla.
US ROLAND 2 LOGISTICS MODEL (ROLOG): USER'S GUIDE
T. E. Wilkerson, J. Neale, S. Dunkin, Edwin Schwemmer, and Bradley B. Dunn Oct. 1978 61 p refs
(Contract DAAK40-76-C-0198)
(AD-A074449) Avail: NTIS HC A04/MF A01 CSCL 09/2

The US ROLAND Logistics Model (ROLOG) is a series of computer programs for processing LSAR data, updating the data base, performing logistic support effectiveness calculations, and reporting data in both graphic and tabular formats. This document is intended to assist the user in executing the programs to achieve realism in the outputs specific to the operational and support scenarios being evaluated. GRA

N80-14961# General Accounting Office, Washington, D. C. Program Analysis Div.
ASSESSING THE OUTPUT OF FEDERAL COMMERCIALLY DIRECTED R/D
27 Aug. 1979 49 p
(PB-299228/7; PAD-79-69) Avail: NTIS HC A03/MF A01 CSCL 05A

To assess the output of Federal commercially directed R&D spending it is necessary to understand the role played by R&D in embodying a laboratory result in a commercially acceptable product or process. The process is complex and the approach to assessing the output of commercially directed research and development is outlined. The interactions occurring between research and development spending and other types of Federal incentives necessary to achieve program goals are analyzed. The

Department of Energy's Solar Photovoltaics program is examined to illustrate the complexities. GRA

N80-14962# Arizona Univ., Tucson. Office of Arid Lands Studies.
WEST COAST FORUM ON APPROPRIATE TECHNOLOGY Final Report
Kennith E. Foster, Roger L. Caldwell, Terry Triffet, and Lina K. Robinson Feb. 1979 56 p Forum held at Tucson, Ariz., 21 Sep. 1978
(Contract NSF CISP-78-22989)
(PB-298986/1; NSF/RA-790003) Avail: NTIS HC A04/MF A01 CSCL 05A

Scientific research support to promote successful performance of appropriate technology (AT) projects is considered including the provision of a scientific educational base as well as an understanding of the societal and economic impacts related to the adoption of AT. Some of the predominant topic areas identified for research include alternative energy sources, small-scale urban organic agriculture technology, alternative waste disposal systems, and water conservation technology. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-14963# California Univ., Los Angeles. Graduate School of Management.
ASSESSMENT OF TECHNOLOGY FOR INFORMATION SERVICES PLANNING
Bennet P. Lientz Aug. 1979 27 p refs
(NR Proj. 049-345)
(AD-A073315) Avail: NTIS HC A03/MF A01 CSCL 05/2

Computer and communication technology is changing at an increased rate. New technologies are emerging; the price-performance of current technology is improving. There is a need to assess the impact of technology on new information systems projects, particularly those dealing with distributed processing and electronic office systems. Such as assessment provides direction and guidance in long range and intermediate term information services planning. It can potentially prevent costly conversion efforts. An approach is developed for obtaining this assessment. Two case examples of applications are also provided which illustrate the method, results, and benefits. GRA

N80-14964# Computer Corp. of America, Cambridge, Mass.
SPATIAL DATA MANAGEMENT SYSTEM Quarterly Research and Development Technical Report, 1 Sep. - 30 Nov. 1978
Christopher F. Herot, David Kramlich, Richard Carling, Mark Friedell, and Jerry Farrell 30 Nov. 1978 83 p refs
(ARPA Order 3487)
(AD-A068863) Avail: NTIS HC A05/MF A01 CSCL 05/2

This fourth quarter of work on the design and implementation of a prototype Spatial Data Management System (SDMS) resulted in the first operational version of the system. The bulk of this effort was devoted to constructing the mechanism through which a user can create, modify, and view an image plane. An image plane is a flat surface upon which a user can store information. As that surface may be considerably larger than the display screen, the SDMS provides a window which can be moved over that surface in order to view parts of it. As the window is moved, the window's position is indicated on an auxiliary screen which serves as a navigational aid containing a map of the entire image plane. This implementation of SDMS at CCA is the first such system to integrate the I-Space creation and viewing operations so that a user can create and modify a database without the need of a skilled computer professional. GRA

N80-14965# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
THE IMS DATA STORAGE HIERARCHY: DSH-1
Chat-Yu Lam and Stuart E. Madnick Aug. 1979 44 p refs
(Grant N00039-78-G-0160)
(AD-A073375; CISR-M010-7908-02; CISR-TR-2) Avail: NTIS HC A03/MF A01 CSCL 09/2

To achieve high performance, large capacity, and high availability, the IMS data base computer takes the approach of implementing the logical information management functions by means of a pipeline of parallel microprocessors and makes use of a storage hierarchy with distributed control for the physical storage and manipulation of very large databases. The data storage hierarchy (DSH) of IMS provides a very large byte addressable virtual address space accessible by the large number of processors that implement the logical information management functions of IMS. A highly parallel structure is used by the DSH to support asynchronous processing of a large number of data requests in order to attain very high throughput. Use of multiple block sizes across the storage levels and use of efficient data movement algorithms contribute to the high performance of DSH. The use of distributed control as well as multiple data redundancy gives DSH the capability to tolerate hardware failures without suffering data loss or availability of service. This report describes the design objectives and the structure of a general data storage hierarchy (DSH-1). Research issues in DSH-1 are also discussed. GRA

N80-14966# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
THE IMS DATA STORAGE HIERARCHY: DSH-2
Chat-Yu Lam and Stuart E. Madnick Aug. 1979 53 p refs
(Grant N00039-78-G-0160)
(AD-A073376; CISR-M010-7908-03; CISR-TR-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

The need for efficient storage and processing of very large data bases coupled with advances in Large Scale Integration (LSI) technology have motivated various proposals to develop specialized computers for data base processing. The IMS data base computer (DBC) approach to this problem is to implement the logical functions of a data base management system by means of a hierarchy of microprocessors and to use a data storage hierarchy for efficient storage and retrieval of very large data bases. GRA

N80-14967# Battelle Columbus Labs., Ohio.
ANNUAL SUMMARY OF TECHNICAL AWARENESS IN THE NONFERROUS METALS INDUSTRY Final Report, 1 May 1977 - 30 Apr. 1978
E. S. Bartlett and B. G. Knehl Apr. 1979 177 p ref
(Grant EPA-R-805095-01)
(PB-299285/7; EPA-600/2-79-092) Avail: NTIS HC A09/MF A01 CSCL 05B

Methods and procedures for maintaining current awareness of technology and commercial trends in the U.S. nonferrous metal mining and manufacturing industry are considered. The principal effort resulted in the publication of six bimonthly technical awareness bulletins during the first year. Items culled from the technical and trade literature are presented as news notes, brief patent and foreign technology abstracts and where the article content warranted, brief analytical summaries of pertinent technology. Examples of the product are appended. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-14968* National Aeronautics and Space Administration, Washington, D. C.
PRESS CONFERENCE: FY 1980 BUDGET
20 Jan. 1979 36 p
(P79-10182) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05C

Both the President's space policy and OMB's anti-inflation policy are reflected in appropriations for NASA's space science, applications, and advances of technology in aeronautics and space programs. Increases in the budgets for each of these areas are examined in the light of the inflation factor and its impact on program management and mission plans. Possible new starts for the future budgets are indicated. A.R.H.

N80-14969* National Aeronautics and Space Administration, Washington, D. C.
THE NASA FY 1980 BUDGET
22 Jan. 1979 8 p
(P79-10183) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05C

While the NASA budget being submitted to Congress totals just over $4.7 billion, and represents an overall increase of some $160 million over fiscal 1979, it falls short of the inflation rate and does not accommodate new programs. Combined with the requirements of the Civil Service Reform Act, the budget will necessitate significant civil service personnel ceiling reductions in the agency. The budget does provide for increased emphasis on the exploration of space, on the practical applications of space capabilities to problems on Earth, and on the advancement of the technology necessary to maintain U.S. leadership in aeronautics and space. It provides full support for the important programs in all areas already underway, and leaves room in the years ahead for the selection of new projects from the many worthy candidates now under consideration. The priority of bringing the space transportation system into operation is again emphasized. A.R.H.

N80-14970# Committee on Science and Technology (U. S. House).
THE SPACE INDUSTRIALIZATION ACT OF 1979
Washington GPO 1979 291 p refs Hearings on H.R. 2337 before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., 22-23 May; 26-27 Jun. 1979
(GPO-50-404) Avail: Subcomm. on Space Sci. and Applications

Issues associated with the prospects for commercial ventures in space, the role of the Federal Government, and the appropriate mechanisms for fostering entry of the private sector are examined. Federal legislation to establish a Space Industrial Corporation to provide means for financing the development of new products, processes, and industries using the properties of the space environment is assessed. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N80-14971*# National Aeronautics and Space Administration, Washington, D. C.
A REVIEW OF NASA INTERNATIONAL PROGRAMS
1 Jan. 1979 112 p refs
(NASA-TM-80845) Avail: NTIS HC A06/MF A01 CSCL 05A

A synoptic overview of NASA's international activities to January 1979 is presented. The cooperating countries and international organizations are identified. Topics covered include (1) cooperative arrangements for ground-based, spaceborne, airborne, rocket-borne, and balloon-borne ventures, joint development, and aeronautical R & D; (2) reimbursable launchings; (3) tracking and data acquisition; and (4) personnel exchanges. International participation in NASA's Earth resources investigations is summarized in the appendix. A list of automatic picture transmission stations is included. A.R.H.

N80-14972# Department of Energy, Washington, D. C.
COMMERCIALIZATION STRATEGY REPORT FOR ELECTRIC AND HYBRID VEHICLES
P. Brown, P. Davis, G. Hagey, and M. Katz [1979] 91 p
(TID-28858-Draft) Avail: NTIS HC A05/MF A01

Barriers to the commercialization of electric powered vehicle technology are identified, along with possible actions to remove specific barriers. Technical, economic, environmental, and institutional readiness are assessed. Recommended commercialization strategies and goals are presented. K.L.

N80-14973# California Univ., Livermore. Lawrence Livermore Lab.
ASSESSMENT OF THE APPLICABILITY OF MECHANICAL ENERGY STORAGE DEVICES TO ELECTRIC AND HYBRID VEHICLES. VOLUME 1: EXECUTIVE SUMMARY M.S. Thesis
M. W. Schwartz 1 May 1979 17 p refs
(Contract W-7405-eng-48)
(UCRL-52773-Vol-1) Avail: NTIS HC A02/MF A01

The power and energy required in a storage device to realize specific improvements upon current and near-term electric vehicle performance specifications are calculated. A review of candidate mechanical energy storage devices concludes that only flywheels and, for some applications, hydraulic accumulators are practical in this context. With respect to each performance specification, data is presented on the vehicle-mass fraction of the mechanical energy storage system as a function of its specific energy and the overall vehicle mass. Mechanical energy storage devices may or may not improve range, depending on the particular configuration of the vehicle and the driving cycle. DOE

N80-14974# California Univ., Berkeley. Inst. of Governmental Studies.
AN INVESTIGATION OF THE REPROCESSING AND WASTE MANAGEMENT REQUIREMENTS OF PRESENT AND ALTERNATIVE NUCLEAR FUEL CYCLES, VOLUME 1 Final Report
G. I. Rochlin Jun. 1979 162 p refs Sponsored by California Energy Commission
(PB-299105/7; CAEC-38-Vol-1; CAEC-300-79-003-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 08J

Various nuclear fuel cycles are examined with regard to economics, health and safety, and proliferation implications. The question of whether reprocessing of nuclear fuel is required in particular fuel cycles is emphasized. This emphasis is prompted by California state law which prohibits (under certain conditions) the licensing of nuclear fission thermal power plants requiring the reprocessing of fuel rods. It is concluded that there are several fuel cycles, including the light water reactor cycle, which do not require reprocessing on technical or resource/economic grounds. The final decision to reprocess in many cases depends upon the resolution of environmental, health, and safety issues. GRA

N80-14975# California Univ., Berkeley. Inst. of Governmental Studies.
AN INVESTIGATION OF THE REPROCESSING AND WASTE MANAGEMENT REQUIREMENTS OF PRESENT AND ALTERNATIVE NUCLEAR FUEL CYCLES. VOLUME 2: APPENDICES Final Report
G. I. Rochlin Jun. 1979 147 p refs Sponsored by California Energy Commission 2 Vol.
(PB-299106/5; CAEC-39-Vol-2; CAEC-300-79-004) Avail: NTIS HC A07/MF A01 CSCL 18J

Detailed descriptions of alternative nuclear fuel cycles

together with material flow sheets, resource consumption, and other data are presented. K.L.

N80-14976# Department of Energy, Bartlesville, Okla. Bartlesville Energy Research Center.
AMBIENT TEMPERATURE, FUEL ECONOMY, EMISSIONS, AND TRIP LENGTH Final Report, Feb. - Sep. 1977
B. H. Eccleston Aug. 1979 123 p
(Contract DOT-TSC-RA-76-48)
(PB-298847/5; DOT-TSC-NHTSA-79-43; DOT-HS-803-668)
Avail: NTIS HC A06/MF A01 CSCL 13F

The relationship among automotive fuel economy, ambient temperature, cold start trip length, and drive-train component temperatures of four 1977 vehicles is examined. Fuel economy, exhaust emission, and drive-train temperatures were measured at temperatures of 20 F, 45 F, 70 F, and 100 F using the 1975 Federal Test Procedure and EPA highway fuel economy test. GRA

88 SPACE SCIENCES (GENERAL)

N80-14977*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HEAO SCIENCE SYMPOSIUM
Carroll Dailey, ed. and Wendell Johnson, ed. Nov. 1979 463 p refs Symp. held at Huntsville, Ala., 8-9 May 1979
(NASA-CP-2113) Avail: NTIS HC A20/MF A01 CSCL 03A

Scientific results from the early analysis of data from the HEAO 1 mission are presented. Development of astronomical catalogs and maps, X-ray variability, extragalactic astronomy, X-ray iron line emission, and optical identification and spectroscopy of X-ray sources are among the topics discussed. Results from HEAO 2 imaging and nonimaging instruments are included. For individual titles, see N80-14978 through N80-15000.

N80-14978*# Naval Research Lab., Washington, D. C.
X-RAY VARIABILITY OBSERVED WITH HEAO A-1 **c89**
Herbert Friedman *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 10-29 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Results from the HEAO A-1 instrument which observed X-ray source variability over a wide range of accessible timescales are surveyed. The objects observed include quasars, BL Lacertae, and active galactic nuclei. A high sensitivity search for X-ray pulsars, known black hole candidates, period fluctuation in binary pulsars, and X-ray and gamma ray bursts are among the topics covered. J.M.S.

N80-14979*# Naval Research Lab., Washington, D. C.
PROGRESS OF THE HEAO A-1 CATALOG **c89**
Kent Wood *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 30-48 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Results from the A-1 all sky survey are used to develop a catalog of X-ray sources. Various techniques used to identify and position the detected sources are discussed. J.M.S.

N80-14980*# California Inst. of Tech., Pasadena.
THE SCIENTIFIC RESULTS OF THE LOW ENERGY PORTION OF A-2 **c89**
Gordon Garmire *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 49-81 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Galactic phenomena observed using the HEAO 1 detectors are discussed. A source map of the soft X-ray sky is presented. Specific topics covered include the optical outburst of U Geminorum, low energy RS CVn stars, and the dwarf nova SS Cygni. Aspects of the SS Cygni pulsations are analyzed. J.M.S.

N80-14981*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HEAO A-2 EXTRAGALACTIC RESULTS **c89**
Elihu Boldt *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 82-100 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Results from the HEAO A-2 experiment concerning the extragalactic X-ray sky are discussed. All-sky maps of hard X-ray sources detected are presented reflecting the temporal variability of the sources that make up the extragalactic X-ray sky. Most of the identified extragalactic objects are not clusters of galaxies but isolated galaxies. Spectra for sources representing classes of active galz galaxies, BL Lacertae ojbects, and N galaxies are discussed in order of luminosity. J.M.S.

N80-14982*# Massachusetts Inst. of Tech., Cambridge.
A-3 SCIENTIFIC RESULTS **c89**
Roger Doxsey *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 101-113 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

The scanning modulation collimator experiment designed to identify the optical counterparts of celestial X-ray sources is described. Identification of galactic sources is discussed. Results concerning active galaxies are presented. J.M.S.

N80-14983*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A-3 SCIENTIFIC RESULTS - EXTRAGALACTIC **c89**
Daniel A. Schwartz *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 114-139 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

The results of the HEAO A-3 experiment are summarized. Specific contributions of the experiment to extragalactic astronomy are emphasized. The discovery of relatively condensed X-ray emission in the cores of those clusters of galaxies which are dominated by a giant elliptical or cD galaxy, the discovery of extended X-ray emitting plasma in groups of galaxies, and the demonstration that BL Lac objects are a class of X-ray sources are among the topics discussed. J.M.S.

N80-14984*# Massachusetts Inst. of Tech., Cambridge.
HIGH ENERGY X-RAY RESULTS FROM HEAO-1: X-RAY PULSARS, AND THE ALL SKY SURVEY **c89**
Alan Levine *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 140-165 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Results of the sky survey performed with the high energy X-ray detectors of the A-4 experiment onboard the HEAO 1 spacecraft are presented. The data presented cover the energy range from 13 to 80 keV. Strong sources are identified by visual inspection and azimuthal superpositions are performed in order to find weak sources. Time variability is also examined. Results of studies of X-ray pulsars are given including a brief description of an X-ray pulsar in terms of current theory. J.M.S.

N80-14985*# California Univ., San Diego.
A-4 SCIENTIFIC RESULTS **c89**
James Matteson *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 166-194 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

Observations of galactic sources, extragalactic sources and gamma bursts with the A-4 instrument at energy 1 energies of between 0.1 to 10 MeV are discussed. Axiumthal scans are presented. The Crab Nebula and its spectrum and the spectrum of Cygnus Z-1 are described. R.E.S.

N80-14986*# Iowa State Univ. of Science and Technology, Ames.
X-RAY EMISSION FROM THE REGION OF GAMMA 195+5 **c93**
R. C. Lamb *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 201-208 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

X-ray observations of nineteen unidentified discrete celestial

gamma ray sources are discussed. Results show some indication of X-rays from the gamma ray source region. On the assumption that the results are valid, it is concluded that the source error box is smaller than what it was. R.E.S.

N80-14987*# Northwestern Univ., Evanston, Ill.
DIFFUSE X-RAY EMISSION FROM ABELL CLUSTERS **c93**
Melvin Ulmer *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 209-213 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

Abell clusters of galaxies, specifically Abell 401 and Abell 399 regions, are discussed. Two sets of satellite observations were made. One was a lunar occultation pointed observation where there were two orbits in which to look at the regions while the moon scanned over it. The other was a scanning observation through the area. Two diffuse models of the X-ray emission were developed. Also, during the investigation three binary cluster systems were found where at least one member was an X-ray source. They were Abell 508, 509, 2177, 2178, 2204, and 2210. R.E.S.

N80-14988*# Indiana Univ., Bloomington.
CORRELATED GROUND BASED OBSERVATIONS IN SUPPORT OF THE HEAO-1 X-RAY OBSERVATORY **c93**
Stewart Mufson *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 214-222 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

Using X-ray and optical photometry of UBVRI fluxes, energetic compact extragalactic sources were studied, such as BL Lacerta (Lac) and BL Lac objects-Markarian (Mrk) 421, Mrk 501, and B2 1308+32. BL Lac and BL Lac objects were found to have predominantly nonthermal spectrums. Photometric and spectroscopic properties of X Persei, an unusual Be star associated with an intrinsically weak X-ray source, were also studied. Both its X-ray and optical emission show complex variability on many different time scales. R.E.S.

N80-14989*# Illinois Univ., Urbana.
THE HEAO-1 NEUTRON STAR TIMING EXPERIMENT **c90**
F. K. Lamb *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 223-243 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

The HEAO-1 neutron star timing experiment is presented. The scientific motivation for the experiment, the reasons for the choice of Her X-1 and Vela X-1 as promising sources to study, the methodology, and the current status of the experiment are summarized. R.E.S.

N80-14990*# Middlebury Coll., Vt.
X-RAY IRON-LINE EMISSION FROM THE SN 185 REMNANT **c93**
P. F. Winkler *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 244-250 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

Radio and optical research was carried out in order to show that the supernova remnant RCW86 is a remnant of the earliest supernova event ever recorded in history (185 AD). The results are as follows: (1) an iron-line emission was found at 6.7 keV; (2) the temperature measured from HEAO-1 was approximately 6 keV; and (3) the equivalent width was consistent within the uncertainties with a cosmic iron abundance. These results support the identification of the supernova remnant RCW86 (it's X-ray source) with the historic supernova event. R.E.S.

N80-14991*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL IDENTIFICATION AND SPECTROSCOPY OF X-RAY SOURCES PRECISELY POSITIONED WITH A-3 **c93**
Richard Griffiths *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 251-260 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

Using a scanning modulation collimator, the optical identification of X-ray sources by means of precise positioning was carried out. Two galactic identifications (4U2129+47 and 2A0311-227) and two extragalactic identifications (NGC 526a and Parkes H2155-304) are described. R.E.S.

N80-14992*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A HIGH ENERGY ASTRONOMY OVERVIEW **c89**
Riccardo Giacconi *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 262-291 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

A technology assessment of extrasolar X-ray astronomy is presented. The role and significance of the Einstein Observatory is described. R.E.S.

N80-14993*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NONDISPERSIVE SPECTROSCOPY OF CELESTIAL X-RAY SOURCES **c89**
Stephen Holt *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 292-328 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

The spectroscope aboard the Einstein Observatory which utilizes nondispersive techniques is presented. Examples of kinds of thermal and nonthermal features that can be seen as well as the possibility of seeing small traces of thermal features in either much higher temperature objects or nonthermal objects are considered. M.M.M.

N80-14994*# Massachusetts Inst. of Tech., Cambridge.
HIGH RESOLUTION X-RAY SPECTROSCOPY ON THE EINSTEIN OBSERVATORY **c89**
George W. Clark *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 329-246 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

The X-ray spectroscope presented features both spectral and one dimensional spatial resolution. The capabilities of observing sources like supernova remnants, X-ray stars, and the halo surrounding galaxies are discussed. M.M.M.

N80-14995*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MONITOR PROPORTIONAL COUNTER **c35**
M. C. Weisskopf *In its* HEAO Sci. Symp. Nov. 1979 p 347-366 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 14B

An Uhuru class Ar-CO2 gas filled proportional counter sealed with a 1.5 mil beryllium window and sensitive to X-rays in the energy bandwidth from 1.5 to 22 keV is presented. This device is coaligned with the X-ray telescope aboard the Einstein Observatory and takes data as a normal part of the Observatory operations. M.M.M.

N80-14996*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
EINSTEIN OBSERVATIONS OF EXTENDED GALACTIC X-RAY SOURCES **c93**
F. D. Seward *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 368-389 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

Features of the X-ray pictures taken aboard the space observatory are presented. Imaging proportional counter pictures in three broad X-ray energy ranges were obtained. The X-ray spectrum of supernova remnants is described. M.M.M.

N80-14997*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
EINSTEIN OBSERVATIONS OF ACTIVE GALAXIES AND QUASARS **c89**
Ethan J. Schreier *In* NASA. Marshall Space Flight Center HEAO Sci. Symp Nov. 1979 p 390-408 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

The radio galaxies Centaurus A and Signus B are discussed. In both these sources, a comparison of the radio and imaged X-ray flux is allowed for the measurement of the magnetic fields. Einstein observations of quasars are discussed. The number of known X-ray emitting QSO's was increased from 3 to 22 and the distances where these QSO's were seen to correspond to an age of 15 billion years. It was shown that these quasars contributed significantly to the X-ray background. M.M.M.

N80-14998*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE STRUCTURE AND EVOLUTION OF X-RAY CLUSTERS OF GALAXIES c90
C. Jones *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 409-421 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

The structure of clusters is described from observations at the Einstein Observatory. It was concluded that the nature of the X-ray emission is complex and varies from broad and highly clumped to smooth and centrally peaked. The clusters whose emission is clumped tend to be rich in spirals and to have X-ray temperatures in the few kilovolt range and low velocity dispersions. The smooth centrally peaked clusters are spiral poor, and have higher temperatures and larger velocity dispersions. For many of the clusters, the emission is irregular and cannot be described by the simple, spherically symmetric models for a hot isothermal or adiabatic gas. For these clusters, the low density, intracluster gas is influenced by the potential of individual bright galaxies. M.M.M.

N80-14999*# Columbia Univ., New York.
COLUMBIA/EINSTEIN OBSERVATIONS OF GALACTIC X-RAY SOURCES c93
Knox S. Long *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 422-438 refs (For primary document see N80-14977 05-88)
(Contract NAS8-30753)
(Contrib-179) Avail: NTIS HC A20/MF A01 CSCL 03B

The imaging observations of galactic clusters are presented. These fall into three categories: pre-main-sequence stars in the Orion nebulae, isolated-main-and-post main-sequence stars, and supernova remnants SNR. In addition to SNR, approximately 30 sources were detected. M.M.M.

N80-15000*# Columbia Univ., New York.
COLUMBIA/EINSTEIN OBSERVATIONS OF EXTRAGALACTIC X-RAY SOURCES c93
William H.-M. Ku *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 439-459 refs (For primary document see N80-14977 05-88)
(Contract NAS8-30753)
(Contrib-180) Avail: NTIS HC A20/MF A01 CSCL 03B

Results are presented of the analysis of data from observations of extragalactic objects with the imaging proportional counter on board the Einstein Observatory. Surveys of normal galaxies, radio galaxies, active galaxies, quasars and BL Lacs, and clusters of galaxies were studied in order to improve the understanding of the origin of the Milky Way Galaxy. M.M.M.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-15001 State Univ. of New York at Stony Brook.
A STUDY OF P CYGNI STARS Ph.D. Thesis
Keun-Myung Lee 1979 145 p
Avail: Univ. Microfilms Order No. 7926271

Model envelopes of the early B-type P Cygni stars are presented. The envelope is assumed to be expanding radially with a supersonic speed, and roughly in radiative equilibrium with the photosphere of the star. The P Cygni profiles of the Balmer lines are used as diagnostic tools for the determination of the mass loss rate and velocity law. The Sobolev method is used to solve the equation of statistical equilibrium for hydrogen atoms in the envelope. Models of four selected P Cygni stars, HD 190603, Chi sup 2 Ori, zeta sup 1 Sco, and P Cyg, show reasonable agreement with observations in the profiles of the Balmer lines, and continuous energy distribution. The velocity laws obtained from these models show outward accelerations. The characteristic slopes of the velocity laws for these stars are found to be correlated with their mass loss rates. Dissert. Abstr.

N80-15002 Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
HARD X-RAY OBSERVATION OF CYGNUS-3
C. Reppin, W. Pietsch, J. Truemper, W. Voges, E. Kendziorra (Tuebingen Univ., West Ger.), and R. Staubert (Tuebingen Univ., West Ger.) May 1979 14 p refs Submitted for publication Sponsored by Deut. Forschungsgemeinschaft
(MPI-PAE/Extraterrest-155) Copyright. Avail: NTIS HC A02

During a balloon observation on October 18, 1977, the high energy X-ray spectrum (20 to 90 keV) of Cyg X-3 was measured with high statistical accuracy. It was found to be consistent with a thermal bremsstrahlung spectrum with kT = 17.5 + 3.1 or - 2.6 keV or a power low E to the minus gamma of the differential photon flux spectrum with gamma equal to 3.6 + or - 0.3. The extrapolation of the observed spectrum to 100 MeV yields a gamma ray intensity which is at least three orders of magnitude below the intensity found by SAS-2. This indicates that the overall spectral behavior of Cygnus X-3 is much different from that of the Crab and Vela pulsars.
Author (ESA)

N80-15003*# Planetary Science Inst., Tucson, Ariz.
PLANETARY ASTRONOMY Final Report
Clark R. Chapman Nov. 1979 122 p refs
(Contract NASw-3134)
(NASA-CR-162526) Avail: NTIS HC A06/MF A01 CSCL 03A

Activities summarized relate to spectrophotometric observations and analysis of asteroids; further observations of the peculiar asteroid 624 Hektor; the search for further asteroid close encounters suitable for mass determination; the infrared search for intra-Mercurial bodies; the search for Venus ashen light; multicolor areal photometry of Uranus and Neptune; and ground-based observations of the Galilean satellites to support the Voyager mission. The following topics are examined: (1) Hektor: the largest highly elongated asteroid; (2) Uranus: disk structure within the 7300 Angstrom methane band; (3) Neptune: limb brightening within the 7300 Angstrom methane band; (4) Neptune's rotation period: a correlation and a speculation on the effect of the disk brightness distribution; (5) observing report on 1979 activities at Kitt Peak National Observatory; and (6) dynamical evolution of intra-Mercurial planetesimals. A.R.H.

N80-15004# Rome Air Development Center, Griffiss AFB, N.Y.
SPECKLE INTERFEROMETRY FOR A PARTIALLY COHERENT SOURCE
Ronald L. Fante Mar. 1979 16 p refs
(AF Proj. 2305-17)
(AD-A074540; RADC-TR-79-96) Avail: NTIS HC A02/MF A01 CSCL 14/5

The spatial frequency transfer function are obtained for speckle interferometry for the case when the source is partially coherent (spatially) and can be approximated by the quasi-stationary model. The transfer function has been examined, and relatively simple approximations to it have been found for the limiting cases of low and high spatial frequencies. These results reduce to previous results in the limiting case when the source is completely incoherent. GRA

N80-15005# Observatoire de Paris-Meudon (France).
THE HIGH SPATIAL RESOLUTION OF INTERFEROMETRY IN THE NEAR INFRARED [LA HAUTE RESOLUTION SPATIALE PAR INTERFEROMETRIE DANS LA PROCHE INFRAROUGE]
Pierre Lena (Univ. Paris 7) 1979 19 p refs In FRENCH; ENGLISH summary Presented at Colloq. de Bordeaux, 6-8 Mar. 1979 Submitted for publication
Avail: NTIS HC A02/MF A01

Methods of restoring spatial coherence in the wave front,

partly destroyed by the turbulent state of the earth atmosphere, are reviewed. A first approach called speckle interferometry which provides the spectral density of several objects such as protostars or stars with extended envelopes, is described. This method achieves high sensitivity and short integration and provides a good frequency coverage of the object. The second approach is Michelson interferometry or aperture synthesis. It may be carried out either with broadband incoherent detection (white light), or with a narrow band (heterodyne). A comparison in terms of merit factor versus wavelength is given. Author (ESA)

N80-14978*# Naval Research Lab., Washington, D. C.
X-RAY VARIABILITY OBSERVED WITH HEAO A-1
Herbert Friedman *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 10-29 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14979*# Naval Research Lab., Washington, D. C.
PROGRESS OF THE HEAO A-1 CATALOG
Kent Wood *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 30-48 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14980*# California Inst. of Tech., Pasadena.
THE SCIENTIFIC RESULTS OF THE LOW ENERGY PORTION OF A-2
Gordon Garmire *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 49-81 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14981*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HEAO A-2 EXTRAGALACTIC RESULTS
Elihu Boldt *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 82-100 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14982*# Massachusetts Inst. of Tech., Cambridge.
A-3 SCIENTIFIC RESULTS
Roger Doxsey *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 101-113 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14983*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A-3 SCIENTIFIC RESULTS - EXTRAGALACTIC
Daniel A. Schwartz *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 114-139 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14984*# Massachusetts Inst. of Tech., Cambridge.
HIGH ENERGY X-RAY RESULTS FROM HEAO-1: X-RAY PULSARS, AND THE ALL SKY SURVEY
Alan Levine *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 140-165 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14985*# California Univ., San Diego.
A-4 SCIENTIFIC RESULTS
James Matteson *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 166-194 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14992*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A HIGH ENERGY ASTRONOMY OVERVIEW
Riccardo Giacconi *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 262-291 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14993*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NONDISPERSIVE SPECTROSCOPY OF CELESTIAL X-RAY SOURCES
Stephen Holt *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 292-328 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14994*# Massachusetts Inst. of Tech., Cambridge.
HIGH RESOLUTION X-RAY SPECTROSCOPY ON THE EINSTEIN OBSERVATORY
George W. Clark *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 329-246 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

N80-14997*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
EINSTEIN OBSERVATIONS OF ACTIVE GALAXIES AND QUASARS
Ethan J. Schreier *In* NASA. Marshall Space Flight Center HEAO Sci. Symp Nov. 1979 p 390-408 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-15006 Virginia Univ., Charlottesville.
STUDIES OF INTERPLANETARY DUST Ph.D. Thesis
John Edward Stanley 1979 86 p
Avail: Univ. Microfilms Order No. 7928000

Data from two sets of interplanetary dust detection experiments are analyzed allowing tentative conclusions concerning the nature and origin of the zodiacal cloud to be made. The small meteoroid detection experiment flown on the Earth orbiting satellite Explorer used semiconductor capacitors to detect submicronsized particles. The sensitivity of these detectors was controlled by the dielectric thickness. The SMDE data taken during the time when major meteor showers were visually observed indicate the presence of small shower associated particles. This result shows that comets are an efficient supplier of small dust particles. Analyses of the data from the meteoroid detection experiment and the imaging photopolarimeter aboard Pioneer 10 and 11 is presented and a comparison between the two is discussed. Dissert. Abstr.

N80-15007# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
THE VELOCITY OF CLUSTERS OF GALAXIES RELATIVE TO THE MICROWAVE BACKGROUND. THE POSSIBILITY OF ITS MEASUREMENT
R. A. Sunyaev and Y. B. Zeldovich 1975 19 p refs (PR-488) Avail: NTIS HC A02/MF A01

The use of microwave background radiation intensity and polarization to determine the radial and tangential relative velocity components of clusters of galaxies is proposed. It is shown that measurements of (delta T/T) on 3 cm and 2 mm wavelengths, with a precision of several percent permits the detection of radial velocities on the order of our galaxy's motion relative to the microwave background. It is also shown that it is possible to find the tangential velocity component by measuring the polarization of the scattered radiation. The existence of two different polarization mechanisms is discussed. Author (ESA)

N80-14989*# Illinois Univ., Urbana.
THE HEAO-1 NEUTRON STAR TIMING EXPERIMENT
F. K. Lamb *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 223-243 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14998*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE STRUCTURE AND EVOLUTION OF X-RAY CLUSTERS OF GALAXIES
C. Jones *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 409-421 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-15008*# National Aeronautics and Space Administration, Washington, D. C.
NEWS CONFERENCE ON VOYAGER-2-JUPITER ENCOUNTER
30 May 1978 53 p Tape transcript
(NASA-TM-30854; P79-10189) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 03B

The proceedings of a news conference on the Voyager 2 Jupiter project are presented. Topics include the instrumentation on the Voyager 2, Jupiter's atmosphere and magnetic field, the Jupiter moons, and the observations of lightning on Jupiter. A.W.H.

N80-15009*# National Aeronautics and Space Administration, Washington, D. C.
PIONEER SATURN ENCOUNTER NEWS BRIEFING
21 Aug. 1979 52 p Tape transcript
(NASA-TM-80353; P79-10193) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 03B

The Pioneer 11 spacecraft, its instruments, data transmission capabilities, and technical problems affecting the scientific objectives of the mission during encounter with Saturn are described. Six far encounter photographs of the planet and a two minute animated film of the impending close encounter are examined. A.R.H.

N80-15010*# National Aeronautics and Space Administration, Washington, D. C.
FUTURE OF PLANETARY EXPLORATION
Robert A. Frosch 14 Sep. 1979 16 p Talk given in San Francisco, 14 Sep. 1979 Tape transcript
(NASA-TM-80352; P79-10194) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 03B

Space exploration missions are discussed in terms of missions completed and missions proposed. The reasons for the exploration of the planets are reviewed including the use of chemical and physical information received from exploration of Mars, Venus, and Jupiter. A.W.H.

N80-15011*# Saint Marys Univ., San Antonio, Tex.
X-RAY DIFFRACTION STUDIES OF SHOCKED LUNAR ANALOGS Final Report
Robert E. Hanss 26 Dec. 1979 33 p refs
(Grant NsG-9039)
(NASA-CR-162555) Avail: NTIS HC A03/MF A01 CSCL 03B

The X-ray diffraction experiments on shocked rock and mineral analogs of particular significance to lunar geology are described. Materials naturally shocked by meteorite impact, nuclear-shocked, or artificially shocked in a flat plate accelerator were utilized. Four areas were outlined for investigation: powder diffractometer studies of shocked single crystal silicate minerals (quartz, orthoclase, oligoclase, pyroxene), powder diffractometer studies of shocked polycrystalline monomineralic samples (dunite), Debye-Scherrer studies of single grains of shocked granodiorite, and powder diffractometer studies of shocked whole rock samples. Quantitative interpretation of peak shock pressures experienced by materials found in lunar or terrestrial impact structures is presented. A.W.H.

N80-15012*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRELIMINARY RESULTS OF PENETRATOR FIELD TEST PROGRAM, TONOPAH, NEVADA, 16-28 APRIL 1979
Maxwell B. Blanchard, Uel Clanton, Mischelle Dalbey (LPI, Houston, Tex.), Victor Rhoper, and James P. Murphy (NASA, Ames Res. Center, Moffett Field, Calif.) Oct. 1979 36 p refs
(NASA-TM-58222; JSC-16221) Avail: NTIS HC A03/MF A01 CSCL 03B

Subscale (0.63 scale) penetrators impacted various sizes of volcanic rocks resting on and within compacted playa sediments. All penetrators were identical in size, shape, weight, and impact velocity. Although minor variations in impact angle were documented, the final orientation of the buried penetrators was primarily a consequence of the size, shape, and depth of the rocks encountered during impact. In situ measurements of impacted penetrators revealed that surface and buried layers of rocks having diameters up to 3 times the penetrator diameter caused only small (< 10 deg) angles of deflection. Only large single rocks greater than 10 times the penetrator diameter caused deflections appreciably greater than 10 deg. The large deflection angles followed by the penetrator were strongly influenced by fracture planes that developed in the rock as it broke apart. No catastrophic failure of the penetrator occurred during these tests. A cross section of the path of each penetrator through the ground is shown together with details on orientation before, during, and after the tests. Comparisons are made with results of previous subscale penetrator tests, and conclusions are drawn with respect to full-scale Mars penetrator performance. M.G.

N80-15013*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTRODUCTION TO THE APOLLO COLLECTIONS: PART 2: LUNAR BRECCIAS
P. E. McGee (Lockheed Electronics Co., Inc., Houston, Tex.), C. H. Simonds (Northrop Services, Inc., Houston, Tex.), J. L. Warner, and W. C. Phinney Feb. 1979 206 p refs
(NASA-CR-162559) Avail: NTIS HC A10/MF A01 CSCL 03B

Basic petrographic, chemical and age data for a representative suite of lunar breccias are presented for students and potential lunar sample investigators. Emphasis is on sample description and data presentation. Samples are listed, together with a classification scheme based on matrix texture and mineralogy and the nature and abundance of glass present both in the matrix and as clasts. A calculus of the classification scheme, describes the characteristic features of each of the breccia groups. The cratering process which describes the sequence of events immediately following an impact event is discussed, especially the thermal and material transport processes affecting the two major components of lunar breccias (clastic debris and fused material). A.R.H.

N80-15014# Los Alamos Scientific Lab., N. Mex.
APOLLO 12 FELDSPATHIC BASALTS 12031, 12038, AND 12072: PETROLOGY, COMPARISON
D. W. Beaty, S. M. R. Hill, A. L. Albee, and W. S. Baldridge 1979 42 p refs Presented at the 10th Lunar Sci. Conf., Houston, Tex., 24 Apr. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1117; CONF-790476-2) Avail: NTIS HC A03/MF A01

Comparison of Modal and chemical data which indicate that 12072, 12038, and 12031, the Apollo 12 feldspathic basalts, form a well defined group which are not related to the other Apollo 12 rock types is presented. The 12072 contains phenocrysts of olivine and pigeonite and microphenocrysts of Cr-spinel set in a fine grained, variolitic groundmass. The 12038 is a medium grained, equigranular basalt with a texture indicating it was multiply saturated. The 12031 is a coarse grained rock with granular to graphic intergrowths of pyroxene and plagioclase; it was multiply saturated. Petrologic observations, as well as

the bulk chemistry, are consistent with the interpretation that 12031 was derived from 12072 through fractionation of Cr-spinel, olivine, and pigeonite, the observed phenocryst assemblage. The general petrologic similarities between 12072, 12031 and the other Apollo 12 basalts are discussed. DOE

N80-15015# Los Alamos Scientific Lab., N. Mex.
PETROLOGY OF THE APOLLO 12 PIGEONITE BASALT SUITE
W. S. Baldridge, D. W. Beaty, S. M. R. Hill, and A. L. Albee 1979 65 p Presented at the 10th Lunar Sci. Conf., Houston, Tex., 24 Apr., 1979
(Contract W-7405-eng-36)
(LA-UR-79-1116; CONF-790476-1) Avail: NTIS HC A04/MF A01

A comparative petrologic study of the Apollo 12 pigeonite basalt suite is presented to understand the textural and petrologic variations within the pigeonite suite and to consider whether these variations are consistent with the hypothesis that the pigeonite basalts are related by crystal fractionation to the olivine basalts. Texturally, the pigeonite basalts range from porphyritic samples with a very fine grained variolitic groundmass to coarse grained microgabbro samples with ophitic to graphic textures. The abundances of olivine and Cr spinel continuously decrease with increasing grain size, whereas the abundances of plagioclase and ilmenite steadily increase. Petrologically, increasing grain size is accompanied by increased Ca in plagioclase, increased Fe in pyroxene, olivine, and spinel, and less Al, Ti, and Cr in pyroxene. These changes, including the differences in bulk chemistry, are explained by near surface fractionation of olivine, pigeonite, and Cr spinel with the compositions of the observed phenocryst phases. DOE

N80-15016# Argonne National Lab., Ill.
REGOLITH LAYERING PROCESSES BASED ON STUDIES OF LOW-TEMPERATURE VOLATILE ELEMENTS IN APOLLO CORE SAMPLES
S. Jovanovic and G. W. Reed, Jr. 1979 28 p refs Presented at 10th Lunar and Planetary Sci. Conf., Houston, Tex., 19 Mar. 1979
(Contract W-31-109-eng-38)
(CONF-790381-1) Avail: NTIS HC A03/MF A01

The concentrations of Hg released at < or = 130 C in stepwise heating experiments on core samples from near the lunar surface increase with depth in response to heating of the surface which during the lunar day are examined. The steepness of the slopes and the depths to which the gradients extend are determined by the color, density and possibly the grain size of the soils. Earlier surface layers are identified and, in general, are in agreement with other indicators of such layers. Low temperature volatilized Br which exhibits trends that parallel those of Hg in a number of cases is studied. The coherence, especially in high temperature fractions, between these chemically dissimilar elements implies a common physical process of entrapment; possibly one related to the presence of vapor deposits on surfaces and to opening and closing of microcracks and pores. DOE

N80-15017# Academy of Sciences (USSR), Moscow. Inst. of Space Research.
NOBLE GASES IN THE ATMOSPHERE OF VENUS, EARTH, AND MARS. THE PROBLEM OF THE ORIGIN OF PLANETARY ATMOSPHERES
M. N. Izakov 1979 27 p refs Submitted for publication
(PR-482) Avail: NTIS HC A03/MF A01

The Venus atmosphere noble gases concentration measurements, performed by means of the Venera 11 and Venera 12 spacecraft mass spectrometers, are presented. These results are used to study the origin of planetary atmospheres by comparing the relative abundance of noble gas isotopes in the atmospheres of terrestrial planets. It is concluded that the process of accretion of gas from the protoplanetary nebula formed most of the Venus atmosphere, a large part of the Earth atmosphere, and part of the Mars atmosphere. Author (ESA)

N80-15018# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
STRUCTURE OF THE MARS LOWER AND MIDDLE ATMOSPHERE BASED ON MARS 5 ULTRAVIOLET PHOTOMETRY DATA
V. A. Krasnopolsky, V. A. Parshev, A. A. Krysko, and V. N. Rogachev 1979 58 p refs
(PR-483) Avail: NTIS HC A04/MF A01

A two channel ultraviolet photometer at 2600 and 2800 A was installed on board the Mars-5 orbiter to study some important components of the Mars atmosphere, such as water vapor and ozone as well as temperature profiles, transport processes, and photochemistry in the lower and middle atmosphere (up to 60Km). One ozone layer and two aerosol layers were found. The ozone layer is 7 km thick and 35 to 40 km high, with a day density number of 10 to the 10th power per cu cm, decreasing by a factor of 3 in the evening. The upper aerosol layer apparently consists of ice particles, it is located at a height of 25 to 40 km in the morning and rises to 60 km in the evening. The lower aerosol layer has on upper boundary at 20 km and single scattering albedo of 0.25 at 2800 A and 0.4 at 2600 A. Author

N80-14154*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PIONEER 11 SATURN ENCOUNTER MISSION SUPPORT
R. B. Miller *In its* The Deep Space Network 15 Dec. 1979 p 24-27 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-15019# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 412, DECEMBER 1978. PART 1: PROMPT REPORTS, DATA FOR NOVEMBER 1978, OCTOBER 1978
Helen E. Coffey, ed. Dec. 1978 168 p
(PB-300877/8; SGD-412-Pt-1; NOAA-79011603) Avail: NTIS HC A08/MF A01 CSCL 03B

The alert period, daily solar indices, solar flares, solar radio waves, solar X-ray radiation, spacecraft observations, coronal holes, inferred IP magnetic field polarities, mean solar magnetic field, solar wind measurements and Boulder geomagnetic substorm log are presented for November 1978. The daily solar activity center, sudden ionospheric disturbances, solar X-ray radiation, solar radio waves, cosmic rays, geomagnetic indices, and radio propagation indices are provided for October 1978. GRA

N80-15020# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 412, DECEMBER 1978. PART 2: COMPREHENSIVE REPORTS, DATA FOR JUNE-MAY 1978, AND MISCELLANEA
Helen E. Coffey, ed. Dec. 1978 83 p refs
(PB-300878/6; SGD-412-Pt-2; NOAA-79011604) Avail: NTIS HC A05/MF A01 CSCL 03B

The active regions, synoptic solar maps, solar flares, solar radio waves, and energetic solar particles and plasma are presented for June 1978. A synoptic chart, abbreviated calendar record, and regional flare index for May 1978 are provided. The solar radio waves for September 1978 and stacked magnetograms for selected events in 1977 are presented. GRA

N80-15021# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 419, JULY 1979. PART 1: PROMPT REPORTS, DATA FOR JUNE 1979, MAY 1979
Helen E. Coffey, ed. Jul. 1979 170 p
(PB-300836/4; SGD-419-Pt-1; NOAA-79082101) Avail: NTIS HC A08/MF A01 CSCL 03B

The alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, coronal holes, solar wind measurements, inferred interplanetary magnetic field polarities, mean solar magnetic field, and Boulder geomagnetic substorm log data are presented for June 1979. The daily solar activity

center, sudden ionospheric disturbances, solar X-ray radiation, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices are provided for May 1979. GRA

N80-15022# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 419, JULY 1979. PART 2: COMPREHENSIVE REPORTS, DATA FOR JANUARY 1979, DECEMBER 1978
Helen E. Coffey, ed. Jul. 1979 99 p
(PB-300837/2; SGD-419-Pt-2; NOAA-79082102) Avail: NTIS HC A05/MF A01 CSCL 03B

The active regions, synoptic solar maps, solar radio emission, energetic solar particles and plasma, and solar X-ray radiation are presented for January 1979. Synoptic charts and abbreviated calendar records for December 1978 are provided. The miscellaneous data includes solar radio emission, daily solar activity center errata, cosmic rays, geomagnetic indices for April 1979, solar flares for December 1978, and regional flare index for November 1978. GRA

N80-14160*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER 1979: UPDATE TO THE RADIAL AND SOLAR CYCLE VARIATIONS IN THE SOLAR WIND PHASE FLUCTUATION SPECTRAL INDEX
A. L. Berman and A. D. Conteas *In its* The Deep Space Network 15 Dec. 1979 p 71-81 refs (For primary document see N80-14150 05-12)
Avail: NTIS HC A06/MF A01 CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-15023*# National Aeronautics and Space Administration, Washington, D. C.
POSSIBLE RADIO EMISSION MECHANISM FOR PULSARS
Yu. A. Kovalev Nov. 1979 25 p refs Transl. into ENGLISH of "Vozmozhnyy Mekhanizm Radioizlucheniya Pulsarov", Rept. Pr-326 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1977 p 1-25 Original language document was announced as A79-45277 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75715; PR-326) Avail: NTIS HC A02/MF A01 CSCL 03B

A mathematical model is presented and discussed as a possible mechanism to describe radio emission from pulsars. The model determines that the magnetic field in the neutron proton electron (npe) layer of a neutron star results from a quasistationary eddy current of superconducting and normal protons relative to normal electrons, which generates radio emission by the Josephson effect. The radiation propagates in the magnetically active medium, from the optically thick npe layer to the magnetosphere through breaks in the crust. As a result, hot radio spots form on the surface of the star, and a radiation pattern forms near the magnetic poles, the cross section of which gives the observed pulse structure. Due to the specific properties of the mechanism, variations of the quasistationary current are converted to amplitude frequency variations of the radiation spectrum. Variations of the fine structure of the spectrum pulse amplitude and spectral index, as well as their correlation are discussed. A.W.H.

N80-15024# Princeton Univ., N. J. Plasma Physics Lab.
PLASMA PHYSICS OF TRAPPING OF COSMIC RAYS AROUND SUPERNOVA
R. M. Kulsrud Jun. 1979 8 p refs Presented at 16th Intern. Cosmic Rays Conf., Kyoto, Japan, 6 Aug. 1979
(Contract EY-76-C-02-3073)
(PPPL-1558; CONF-790836-1) Avail: NTIS HC A02/MF A01

Two problems associated with the question of whether a large number of cosmic rays produced in the early stages of expansion of a supernova bubble would be trapped in it are discussed. They are the determination of the manner in which the cosmic ray anisotropy and the Alfven wave energy density, driven unstable by this anisotropy evolve towards equilibrium balance and how the singularity associated with standard quasilinear theory for resonant interaction, which occurs for pitch angles near 90 degrees, are treated by inclusion of other nonlinear effects. A.W.H.

N80-14986*# Iowa State Univ. of Science and Technology, Ames.
X-RAY EMISSION FROM THE REGION OF GAMMA 195+5
R. C. Lamb *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 201-208 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14987*# Northwestern Univ., Evanston, Ill.
DIFFUSE X-RAY EMISSION FROM ABELL CLUSTERS
Melvin Ulmer *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 209-213 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14988*# Indiana Univ., Bloomington.
CORRELATED GROUND BASED OBSERVATIONS IN SUPPORT OF THE HEAO-1 X-RAY OBSERVATORY
Stewart Mufson *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 214-222 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14990*# Middlebury Coll., Vt.
X-RAY IRON-LINE EMISSION FROM THE SN 185 REMNANT
P. F. Winkler *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 244-250 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14991*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
OPTICAL IDENTIFICATION AND SPECTROSCOPY OF X-RAY SOURCES PRECISELY POSITIONED WITH A-3
Richard Griffiths *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 251-260 (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14996*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
EINSTEIN OBSERVATIONS OF EXTENDED GALACTIC X-RAY SOURCES
F. D. Seward *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 368-389 refs (For primary document see N80-14977 05-88)
Avail: NTIS HC A20/MF A01 CSCL 03B

N80-14999*# Columbia Univ., New York.
COLUMBIA/EINSTEIN OBSERVATIONS OF GALACTIC X-RAY SOURCES
Knox S. Long *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 422-438 refs (For primary document see N80-14977 05-88)
(Contract NAS8-30753)
(Contrib-179) Avail: NTIS HC A20/MF A01 CSCL 03B

N80-15000*# Columbia Univ., New York.
COLUMBIA/EINSTEIN OBSERVATIONS OF EXTRAGALACTIC X-RAY SOURCES
William H.-M. Ku *In* NASA. Marshall Space Flight Center HEAO Sci. Symp. Nov. 1979 p 439-459 refs (For primary document see N80-14977 05-88)

(Contract NAS8-30753)
(Contrib-180) Avail: NTIS HC A20/MF A01 CSCL 03B

99 GENERAL

N80-15025*# Illinois Univ., Urbana. Aeronomy Lab.
RESEARCH IN AERONOMY Progress Report, 1 Oct. 1978 - 31 Mar. 1979
Belva Edwards, ed. 31 Mar. 1979 76 p refs Sponsored by NASA and NSF
(NASA-CR-162558; PR-79-1) Avail: NTIS HC A05/MF A01 CSCL 04B

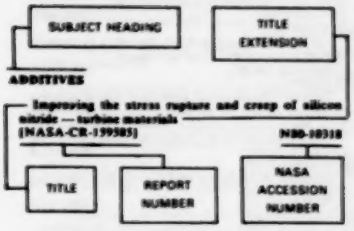
Topics covered include planetary wave dynamics; nitric oxide and planetary waves in the lower ionosphere; ellipse launches; Nike Orion payloads, energy budget, energetic particles in the midlatitude and equatorial zones; electron density in the nighttime ionosphere; partial-reflection drift measurements in the D-region, the structure and variability of atmospheric tides; coherent scatter-radar; and a laser system for measuring the distribution of atmospheric sodium in the 80 km to 100 km altitude. A.R.H.

N80-15026# Department of Defence, Canberra (Australia).
AERONAUTICAL RESEARCH LABORATORIES Annual Report, 1977 - 1978
1978 95 p refs
(RM78/30107) Avail: NTIS HC A05/MF A01

Research and development in the areas of aerodynamic configurations and aeronautical engineering for design purposes and/or operational aspects of aircrafts is presented. Wind tunnel tests, materials tests, engine tests, and aircraft structural analysis are discussed. A.W.H.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

ABILITIES
Ability, involvement and climate as multiple and interactive predictors of performance
[AD-A068891] N80-14706
Methodological and conceptual issues in understanding ability-performance relationships
[AD-A068894] N80-14708
ABLATION
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation
[AD-A073859] N80-14388
ABLATIVE MATERIALS
Thermal protection system repair kit program
[NASA-CR-160418] N80-14181
ABRASION
Abradable compressor and turbine seals, volume 1 — for turbofan engines
[NASA-CR-159600] N80-14235
ABSORBERS [EQUIPMENT]
Evluation of performance enhancement of solar powered absorption chiller with an improved control strategy using the BNL-built hardware simulator
[BNL-26218] N80-14552
ABSORBERS [MATERIALS]
Electromagnetic power absorber
[NASA-CASE-NPO-13830-1] N80-14281
Propagation in acoustically absorbent materials N80-14865
ABSORPTION SPECTRA
Two photon spectroscopy of pyrazine and triazine
[AD-A074055] N80-14219
ABSORPTIVITY
Studies of directly absorbing fluids for mid-temperature solar thermal applications
[MLM-2625-OP] N80-14540
ACCELERATED LIFE TESTS
Development of an accelerated test design for predicting the service life of the solar array at Mead, Nebraska
[NASA-CR-162534] N80-14483
ACCELEROMETERS
Methods for strap-down attitude estimation and navigation with accelerometers N80-14034
ACCIDENT PREVENTION
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Self-study guide
[PB-299256/8] N80-14723
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/6] N80-14724
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 1
[PB-299305/3] N80-14725
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 2
[PB-299306/1] N80-14726
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 3
[PB-299307/9] N80-14727
ACCOMMODATION COEFFICIENT
An extended soft-cube model for the thermal accommodation of gas atoms on solid surfaces
[NASA-TM-81163] N80-14941
ACCURACY
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project N80-14103
ACETYL COMPOUNDS
The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment N80-14731
ACOUSTIC ATTENUATION
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems
[NASA-CR-162556] N80-14842
ACOUSTIC DUCTS
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems
[NASA-CR-162556] N80-14842
Propagation in ducts N80-14864
ACOUSTIC EMISSION
Acoustic emission: An application to fracture mechanics N80-14430
Optical probing of acoustic emission waves — acoustic measurement of acoustic emission using piezoelectric transducers compared optical techniques of measurement
[AD-A074160] N80-14854
ACOUSTIC IMPEDANCE
Propagation in acoustically absorbent materials N80-14865
ACOUSTIC MEASUREMENTS
Optical probing of acoustic emission waves — acoustic measurement of acoustic emission using piezoelectric transducers compared optical techniques of measurement
[AD-A074160] N80-14854
Measurement of sound velocity in liquid metals
[UCID-18171] N80-14857
Experimental measurements of moving noise sources N80-14868
Aeroacoustic measuring techniques in or outside turbulent flows N80-14876
ACOUSTIC PROPAGATION
A monolithic surface acoustic wave charge transfer device N80-14837
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
Acoustic implications of mesoscale oceanographic phenomena — study of effect of ocean currents on acoustic propagation using an ocean model for underwater acoustics
[AD-A074456] N80-14855
Special Course on Acoustic Wave Propagation
[AGARD-R-686] N80-14858
A general survey of studies on acoustic wave propagation N80-14859
Acoustic equations in moving fluids N80-14860
Mathematical techniques for acoustic propagation problems N80-14862
Directivity of acoustic radiation from sources N80-14863
Propagation from moving sources in flows — jet aircraft noise N80-14869
Random propagation and random scattering — acoustic wave propagation N80-14871
Underwater acoustic problems N80-14872
Finite-amplitude wave propagation — acoustic propagation in nonlinear media N80-14874
ACOUSTIC PROPERTIES
Acoustic considerations of flight effects on jet noise suppressor nozzles
[NASA-TM-81377] N80-14843
ACOUSTIC SCATTERING
Underwater sound scattering by marine organisms. A review — sonar interference
[MRL-R-756] N80-14841
Random propagation and random scattering — acoustic wave propagation N80-14871
Experimental and numerical results of sound scattering by a body — interaction of aerodynamic noise and fuselage N80-14873
ACOUSTIC SOUNDING
Atmospheric echo sounding. A bibliography with abstracts
[NTIS/PS-0989/8] N80-14626
ACOUSTIC VELOCITY
Thermodynamic properties of nitrogen gas derived from measurements of sound speed — for cryogenic wind tunnels
[NASA-RP-1051] N80-14257
Sound velocity and equation-of-state measurements in high pressure fluid and solid helium
[LA-UR-79-721] N80-14856
Measurement of sound velocity in liquid metals
[UCID-18171] N80-14857
ACOUSTICAL HOLOGRAPHY
Analog and digital hardware development for a microcomputer controlled data acquisition system for acoustical imaging
[AD-A074446] N80-14763
Digital wavefront reconstruction for acoustical applications
[AD-A073775] N80-14845
ACOUSTICS
A constant percentage bandwidth transform for acoustic signal processing N80-14280
Acoustic Energy N80-14866
ACOUSTO-OPTICS
A study on selected wideband guided-wave acousto-optic and electrooptic devices N80-14899
ACRYLIC RESINS
Acoustic emission: An application to fracture mechanics N80-14430
ACTIVATED SLUDGE
Health effects of aerosols emitted from an activated sludge plant
[PB-299583/5] N80-14696
ADAPTIVE CONTROL
Preliminary study on the utilization of adaptive radar receivers with diversity polarization N80-14081
Communication application of adaptive arrays
[AD-A074558] N80-14307
A generalized sidelobe cancelling structure for adaptive arrays
[AD-A074899] N80-14319
Workshop on Adaptive Control
[AD-A072723] N80-14796
ADAPTIVE FILTERS
Microcomputer-based on-line state estimation with applications to satellites N80-14033
Dynamic clutter reduction techniques with moving target indicated adaptive filters N80-14080
Adaptive equalization of delay distorted signals
[REPT-13-78] N80-14326
ADAPTIVE OPTICS
An algebraic model of adaptive optics for continuous-wave thermal blooming
[AD-A074741] N80-14906
ADDITIVES
Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256

Construction of an ice-retardant overlay — asphalt additive
[PB-298876/4] N80-14274

ADJOINTS
Limits and adjoint situations in mathematical structures
[CSIR-TWISK-47] N80-14809

AERIAL PHOTOGRAPHY
Forester's guide to aerial photo interpretation — timber inventory
N80-14425

AEROACOUSTICS
Acoustically swept rotor — helicopter noise reduction
[NASA-CASE-ARC-11106-1] N80-14107
Application of diffraction theory to aeroacoustics — aircraft noise
N80-14870
Experimental and numerical results of sound scattering by a body — interaction of aerodynamic noise and fluidage
N80-14873
Aeroacoustic measuring techniques in or outside turbulent flows
N80-14876

AERODYNAMIC CHARACTERISTICS
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188] N80-14046
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162320] N80-14052
Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14053
Quiet short-haul research aircraft familiarization document — STOL
[NASA-TM-81149] N80-14108

AERODYNAMIC CONFIGURATIONS
Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14053

AERODYNAMIC INTERFERENCE
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3210] N80-14047

AERODYNAMIC NOISE
Acoustically swept rotor — helicopter noise reduction
[NASA-CASE-ARC-11106-1] N80-14107
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems
[NASA-CR-162556] N80-14842
Radiated noise due to boundary-layer transition
[AD-A073491] N80-14846
Experimental and numerical results of sound scattering by a body — interaction of aerodynamic noise and fluidage
N80-14873

AERODYNAMIC STABILITY
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-value controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531] N80-14123
Flight testing of the buffeting behavior of combat aircraft
[ESA-TT-523] N80-14143

AERODYNAMIC STALLING
High angle of attack characteristics of different fighter configurations
[MDB-UFE-1643[O]] N80-14058
Separated turbulent flow behind a stalled airfoil
[AAAF-NT-79-12] N80-14059
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability — F-16
[NASA-TP-1538] N80-14136

AERODYNAMICS
Modification of axial compressor streamline program for analysis of engine test data
[NASA-TM-79312] N80-14051
Aeronautical Research Laboratories
[RM78/30107] N80-15026

AERONAUTICAL ENGINEERING
A review of NASA international programs
[NASA-TM-80845] N80-14971
Aeronautical Research Laboratories
[RM78/30107] N80-15026

AERONOMY
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar
[NASA-CR-162558] N80-15025

AEROSOLS
Aerometric data analysis for the Houston Area Oxidant Study, volume 2
[PB-299648/4] N80-14599
Particulate sampling and analysis
[PB-299637/9] N80-14601
Health effects of aerosols emitted from an activated sludge plant
[PB-299583/5] N80-14696
Analytic modeling of aerosol size distributions
[NASA-CR-159170] N80-14815

AEROSPACE ENGINEERING
Guidelines for space materials selection
[ESA-PSS-07/QRM-01-ISSUE-5] N80-14187
Press conference: FY 1980 budget
[P79-10182] N80-14968
The NASA FY 1980 budget
[P79-10183] N80-14969

AEROSPACE ENVIRONMENTS
The current status of predictions of low energy plasma interactions with space systems — plasma interactions with spacecrafts in orbit due to space charge and magnetosphere
[AD-A074523] N80-14186
Space Dosimetry, Volume 1: Project description
[FRI-R646/3-VOL-1] N80-14380
Interaction of high voltage surfaces with the space plasma — solar arrays
[NASA-CR-159731] N80-14923

AEROSPACE MEDICINE
Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
[ESA-BR-01] N80-14677
Recent advances in Aeronautical and Space Medicine
[AGARD-CP-265] N80-14678
Problems related to medical criteria for the selection of military navigation personnel
N80-14679
An advanced oxygen system for future combat aircraft
N80-14680
The European approach to the selection and training of SL payload specialists
N80-14681
Physiological factors in space operations. Emphasis on space shuttle
N80-14682
Supersonic aerial transport: Medical and physiological aspects — Concorde aircraft
N80-14683
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL] N80-14728
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738

AEROSPACE TECHNOLOGY TRANSFER
Technologies for the handicapped and the aged
[NASA-TM-80842] N80-14715

AFRICA
Report of the Second Session of the WAMEX Scientific and Management Regional Committee
[GARP-SPEC-REPT-35] N80-14657

AGING [METALLURGY]
Thermal aging characteristics of electrodeposited black chrome solar coatings
[SAND-78-2094C] N80-14527

AGRICULTURE
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York
N80-14424
Overview of agrometeorology — influence of meteorological parameters on crop growth
N80-14441
Remote sensing applied to agriculture
N80-14446
Satellite remote sensing in hazard monitoring and disaster evaluation
N80-14456
Satellite remote sensing for agricultural advisories and planning
N80-14457
Groundwater resources of the Texas high plains: State-of-the-art and future research needs
[PB-298147/0] N80-14469

AGROCLIMATOLOGY
Satellite Remote Sensing: Applications in Agroclimatology and Agrometeorology
[ESA-SP-1020] N80-14440
Overview of remote sensing for agriclimatology and agrometeorology
N80-14442
The agro-ecological zones project — agroclimatic and land suitability assessment for various crops
N80-14445
Agroclimatological methods involving remote sensing techniques
N80-14451

AGROMETEOROLOGY
Satellite Remote Sensing: Applications in Agroclimatology and Agrometeorology
[ESA-SP-1020] N80-14440
Overview of agrometeorology — influence of meteorological parameters on crop growth
N80-14441
Overview of remote sensing for agriclimatology and agrometeorology
N80-14442
Crop environment monitoring: The remote sensing systems
N80-14452
Crop monitoring and prediction using satellite data
N80-14455

AILERONS
Study of the formation of laminar flow separation induced by the deflection of a control surface — during hypersonic wind tunnel tests
[REPT-79-2] N80-14060

AIR
Measurement of the radiative properties of air at high temperatures and pressures
[AD-A074825] N80-14218
Absorption of sound waves in the atmosphere
N80-14867

AIR DUCTS
The analysis of sound propagation in jet engine ducts using the finite difference method
[AD-A074233] N80-14853

AIR FILTERS
The transfer of carbon fibers through a commercial aircraft water separator and air cleaner
[NASA-CR-159183] N80-14359

AIR FLOW
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532] N80-14124

AIR NAVIGATION
Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017

AIR POLLUTION
A box model study for global and regional sulfur circulations
N80-14580
Sulfate and nitrate collected by filter sampling near the tropopause
[NASA-TP-1567] N80-14581
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 1
[PB-299191/7] N80-14590
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 2
[PB-299192/5] N80-14591
The air quality data handling system user's guide
[PB-298996/0] N80-14592
Fugitive and fine particle control using electrostatically charged fog
[PB-298069/6] N80-14593
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-298473/0] N80-14595
Houston area oxidants study, program summary
[PB-299638/7] N80-14598
Aerometric data analysis for the Houston Area Oxidant Study, volume 2
[PB-299648/4] N80-14599
Aerometric data analysis for the Houston Area Oxidant Study. Volume 1: Executive summary
[PB-299647/8] N80-14600
Particulate sampling and analysis
[PB-299637/9] N80-14601
Aerometric data analysis for the Houston area oxidant study. Volume 3: Data summaries for the Houston area oxidant study
[PB-299649/4] N80-14602
Urban-rural insolation correlation study — air pollution over metropolitan St. Louis
[DOE/ET-0092] N80-14618

AIR QUALITY
Imperial Valley environmental project: Air quality assessment
[UCRL-52699] N80-14585
The air quality data handling system user's guide
[PB-298996/0] N80-14592

AIR SAMPLING
Sulfate and nitrate collected by filter sampling near the tropopause
[NASA-TP-1567] N80-14581

AIR TRAFFIC
Air traffic density and distribution measurements
[AD-A073229] N80-14064

AIR TRAFFIC CONTROL
State of the art for digital avionics and controls, 1978
N80-14018
Air traffic density and distribution measurements
[AD-A073229] N80-14064
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Problems related to the design and construction of a radar network
N80-14066
Methodology for the evaluation of a radar site
N80-14067
Performance evaluation methods of a secondary radar network
N80-14068
Organization of an integrated global maintenance service — Radar Networks
N80-14069
Automation of flight on-line strategic control: The case of speed control on pre-established routes
N80-14970
Radar data utilization in automating the sequencing of aircrafts in terminal areas
N80-14071

Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072

Tracking algorithms for mono and multiradar
N80-14074

A distributed processing system for radar data presentation
N80-14075

Filtering of synthetic radar data
N80-14076

Visual displays for air traffic control data
N80-14077

Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086

An air traffic channel simulation by means of ray-tracing techniques
N80-14088

L-band measurements in the air traffic channel to characterize secondary radar systems
N80-14092

Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100

Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105

Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time
[NASA-TM-80194] N80-14114

Proceedings, Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems
[NASA-CP-2104] N80-14633

Needed weather information where it belongs; in the cockpit
N80-14635

Atlanta Air Route Traffic Control Center's involvement in aviation weather
N80-14637

AIR TRAFFIC CONTROLLERS [PERSONNEL]

An exploratory study of psychophysiological measurements as indicators of air traffic control sector workload
N80-14755

Individual and system performance indices for the air traffic control system
N80-14756

Workload and stress in air traffic controllers
N80-14757

AIRBORNE/SPACEBORNE COMPUTERS

A method for designing multiprocessor architectures for avionics functions
N80-14021

Redundancy management considerations for a control-configured fighter aircraft triplex digital fly-by-wire flight control system
N80-14026

The integrity of onboard computer programs: A solution
N80-14028

An assessment of and approach to the validation of digital flight control systems
N80-14036

The avionics computer program: Practical experiences with a methodology — Mirage F1 and Mirage 200 aircraft
N80-14037

COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications
N80-14041

AIRCRAFT ACCIDENT INVESTIGATION

Accident investigation
N80-14636

AIRCRAFT CONFIGURATIONS

Altitude response of several airplanes during landing approach — including space shuttle
[NASA-TM-80186] N80-14139

AIRCRAFT CONSTRUCTION MATERIALS

Protective coatings for aircraft composites in nuclear environments
[AD-A074889] N80-14199

AIRCRAFT CONTROL

Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017

State of the art for digital avionics and controls, 1978
N80-14018

AIRCRAFT DESIGN

Quiet short-haul research aircraft familiarization document — STOL
[NASA-TM-81149] N80-14108

AIRCRAFT ENGINES

Exhaust emission reduction for intermittent combustion aircraft engines
[NASA-CR-159757] N80-14130

On the use of vibration self-damping materials in the manufacture of parts for rotating machinery
N80-14135

AIRCRAFT EQUIPMENT

A high accuracy flight profile determining system — systems analysis of inertial navigation system for aircraft position determination
N80-14042

Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF
[MRL-R-752] N80-14233

AIRCRAFT FUEL SYSTEMS

Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256

AIRCRAFT FUELS

Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time
[NASA-TM-80194] N80-14114

AIRCRAFT GUIDANCE

Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017

AIRCRAFT HAZARDS

An evaluation of the bird/aircraft strike hazard at Barksdale Air Force Base, Louisiana [SAC]
[AD-A074390] N80-14063

Needed weather information where it belongs; in the cockpit
N80-14635

AIRCRAFT INSTRUMENTS

Preliminary investigation of pilot scanning techniques of dial pointing instruments
[NASA-TM-80079] N80-14697

AIRCRAFT LANDING

Altitude response of several airplanes during landing approach — including space shuttle
[NASA-TM-80186] N80-14139

AIRCRAFT MAINTENANCE

Study of turboprop systems reliability and maintenance costs
[NASA-CR-135192] N80-14129

AIRCRAFT MANEUVERS

Sonic-boom wave-front shapes and carvatures associated with maneuvering flight
[NASA-TP-1611] N80-14045

AIRCRAFT MODELS

Quiet Clean Short-Haul Experimental Engine [QCSEE] acoustic and aerodynamic tests on a scale model over-the-wing thrust reverser and forward thrust nozzle
[NASA-CR-135254] N80-14115

AIRCRAFT NOISE

High frequency broadband rotor noise — method to find level of high frequency broadband aircraft noise due to rotary wings
N80-14838

Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations — conducted in the Langley V/STOL tunnel
[NASA-TP-1608] N80-14840

Applications of diffraction theory to aeroacoustics — aircraft noise
N80-14870

AIRCRAFT PERFORMANCE

Handling qualities, workload and heart rate
N80-14730

AIRCRAFT PILOTS

Problems related to medical criteria for the selection of military navigation personnel
N80-14679

Concerning individual equipment for fighter pilots in the Air Force
N80-14735

AIRCRAFT RELIABILITY

Automatic recovery after sensor failure onboard
N80-14024

AIRCRAFT SAFETY

Effect of weather conditions on airport operations
N80-14638

Current research on aviation weather [bibliography], 1979
[NASA-CR-3214] N80-14651

AIRCRAFT STRUCTURES

Review of investigations into aeronautics related fatigue Federal Republic of Germany
[LBF-S-142] N80-14422

AIRCRAFT SURVIVABILITY

Protective coatings for aircraft composites in nuclear environments
[AD-A074889] N80-14199

AIRFIELD SURFACE MOVEMENTS

Simulation of a surveillance and control system of surface traffic in an airport
N80-14073

Effect of weather conditions on airport operations
N80-14638

AIRFOILS

An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056

AIRFRAMES

Target missile airframe costs
[AD-A073314] N80-14112

AIRPORT PLANNING

Methodology for the evaluation of a radar site
N80-14067

AIRPORT SURFACE DETECTION EQUIPMENT

On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065

Simulation of a surveillance and control system of surface traffic in an airport
N80-14073

Development trends of airport surface traffic control radar
N80-14087

Automatic systems for airport surface mobile media surveillance based on the use of secondary media
N80-14104

AIRPORTS

An evaluation of the bird/aircraft strike hazard at Barksdale Air Force Base, Louisiana [SAC]
[AD-A074390] N80-14063

Reflection cracking of bituminous overlays for airport pavements: A state of the art
[AD-A073484] N80-14144

Effect of weather conditions on airport operations
N80-14638

Approaches to CW agent area detection systems for airfields
N80-14733

AIRSHIPS

Proceedings of the 10th AFGL Scientific Balloon Symposium — conference
[AD-A074469] N80-14057

Propulsion options for the HI SPOT long endurance drone airship
[AD-A074995] N80-14132

AIRSPACE

Air traffic density and distribution measurements
[AD-A073229] N80-14064

AJ-10 ENGINE

Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code
[AD-A076914] N80-14193

ALASKA

Sea breezes on the Alaskan arctic coast
N80-14632

ALCOHOLS

Syntheses and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14346

ALGORITHMS

Automation of flight en-line strategic control: The case of speed control on pre-established routes
N80-14070

Radar data utilization in automating the sequencing of aircrafts in terminal areas
N80-14071

Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072

Tracking algorithms for mono and multiradar
N80-14074

Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099

Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100

A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14102

Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105

Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time
[NASA-TM-80194] N80-14114

An efficient program for decoding the [255,223] Reed-Solomon code over GF [2 to the 8th power] with both errors and erasures, using transform decoding
N80-14161

Robust waveform design
[AD-A074932] N80-14311

Generalization algorithms
N80-14435

An algorithm for the linearization of raster images for minicomputers
N80-14439

Study and investigation of infrared multispectral target cueing techniques
[AD-A074799] N80-14458

Kalman filter processing of position and Doppler radar measurement in coupled Cartesian coordinates
[REPT-274] N80-14459

Insolation models, data and algorithms
[SERI/TR-36-110] N80-14617

Clustering algorithm evaluation and the development of a replacement for procedure 1 — for crop inventories
[NASA-CR-160424] N80-14772

Search. A section of the handbook of artificial intelligence
[AD-A074078] N80-14797

Contributions to constrained optimization — nonlinear programming
N80-14801
Finding the root of a monotonic function
[CSIR-TWISK-75] N80-14806
ALKALINE BATTERIES
Improved thermal battery performance
[AD-A072056] N80-14506
ALLOCATIONS
Press conference: FY 1980 budget
[P79-10182] N80-14968
The NASA FY 1980 budget
[P79-10183] N80-14969
ALTITUDE CONTROL
Altitude response of several airplanes during landing approach — including space shuttle
[NASA-TM-80186] N80-14139
ALUMINUM
Recent improvements to the ASTM-type ultrasonic reference block system — ultrasonic flaw detection used on aluminum blocks
[AD-A074726] N80-14852
Heat capacity of amorphous and disordered Nb3Ge thin films
N80-14931
ALUMINUM ALLOYS
Acoustic emission: An application to fracture mechanics
N80-14410
ALUMINUM OXIDES
Hydrogenation catalysts derived from Mo[CO]6/alumina
N80-14208
Substructure and properties of sodium beta alumina solid electrolytes
[EPRI-FP-1058] N80-14224
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252
AMINES
Preparation and catalytic oxidizing potential of polymer supported chelating amine and Schiff base complexes
[AD-A073678] N80-14250
AMMONIA
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility
N80-14930
AMMONIUM COMPOUNDS
Carborane synthesis — thermolysis of tetraethylammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570] N80-14217
AMPLIFIER DESIGN
Energy-dependent losses in pulsed-feedback preamplifiers
[LBL-8135] N80-14348
AMPLIFIERS
An examination of ancillary equipment for a proposed 34.3 GHz high power gyrotron TWT amplifier
N80-14156
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52668] N80-14253
AMPLITUDES
The implication of Pn amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14606
ANAEROBES
Fast production of methane by anaerobic digestion, volume I — solid waste utilization
[CDO-2900-17-VOL-1] N80-14268
Biological conversion of biomass to methane
[CDO-2917-T-12] N80-14270
ANALOG SIMULATION
GIM code user's manual for the STAR-100 computer — for generating numerical analogs of the conversion laws
[NASA-CR-3157] N80-14354
ANALOG TO DIGITAL CONVERTERS
DSN radio science system, Mark III-80
N80-14152
Program controlled cartographic generalization of buildings, for 1:25000 topographic maps
N80-14430
Analog and digital hardware development for a microcomputer controlled data acquisition system for acoustical imaging
[AD-A074446] N80-14763
ANALYSIS (MATHEMATICS)
Mathematical techniques for acoustic propagation problems
N80-14862
ANALYSIS OF VARIANCE
Randomization procedures for a two way analysis of orientation data — directional orientation in animals
N80-14824
ANALYTIC GEOMETRY
Computation of the radiation characteristics of antennas on complicated structures in the high frequency case. Principle of the geometrical theory of diffraction
[ESA-TT-593] N80-14328
Ray tracing and application of the geometrical theory of diffraction for calculating the scattered fields of complicated structures
[ESA-TT-595] N80-14789
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819
ANALYZERS
Development of a comparative analyzer for microprocessor
[BDX-613-2040-REV] N80-14765
ANATOMY
A model for the computational determination of parameter values of anthropomorphic segments
[CSIR-TWISK-79] N80-14807
ANGLE OF ATTACK
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14048
High angle of attack characteristics of different fighter configurations
[MBB-UFE-144[O]] N80-14058
Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg — Langley 12-foot low speed wind tunnel test
[NASA-TM-80199] N80-14110
The calculation of inviscid separated flow about a slender cone for large angles of attack
[RAE-TR-2009] N80-14360
ANGULAR MOMENTUM
The generalized phase shift approach to rotational excitation in dilute diatomic gases
N80-14202
ANGULAR VELOCITY
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11428] N80-14908
ANIMALS
Randomization procedures for a two way analysis of orientation data — directional orientation in animals
N80-14824
ANODES
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry
[AD-A074806] N80-14216
Multiple anode arc lamp system
[NASA-CASE-NPO-10857-1] N80-14330
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
ANTENNA ARRAYS
Communication application of adaptive arrays
[AD-A074558] N80-14307
A generalized sidelobe canceling structure for adaptive arrays
[AD-A074899] N80-14319
ANTENNA DESIGN
Resonant frequency of microstrip antennas calculated from TE-excitation of an infinite strip embedded in a grounded dielectric slab
[NASA-TM-80190] N80-14289
ANTENNA RADIATION PATTERNS
Synthesis of linear array radiation patterns
N80-14090
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
Computation of the radiation characteristics of antennas on complicated structures in the high frequency case. Principle of the geometrical theory of diffraction
[ESA-TT-593] N80-14328
Ray tracing and application of the geometrical theory of diffraction for calculating the scattered fields of complicated structures
[ESA-TT-595] N80-14789
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
ANTENNAS
Antenna-coupled infrared detectors
[AD-A074085] N80-14320
Television receiving antenna system component measurements
[PB-298873/1] N80-14329
ANTHROPOMETRY
Anthropometric sizing, fit-testing and evaluation of the MBU-12/P oral-nasal oxygen mask
[AD-A074723] N80-14692
Design criteria for characterizing individuals in the extreme upper and lower body size ranges
[AD-A072353] N80-14721
A model for the computational determination of parameter values of anthropomorphic segments
[CSIR-TWISK-79] N80-14807
ANTICHOLINERGICS
The effects of acute and chronic low dose exposure to anticholinesterases
N80-14729
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
ANTIDOTES
Therapy on nerve agent poisoning
N80-14732
ANTIPROTONS
High resolution magnetic spectrometer for antiproton physics at rest and low energies
[BNL-24662] N80-14890
ANTIREFLECTION COATINGS
Infrared laser window coating by plasma polymerization
[AD-A073008] N80-14393
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
APOLLO PROJECT
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559] N80-15013
APOLLO 11 FLIGHT
Anniversary of Apollo 11 moon landing press conference
[NASA-TM-80844] N80-14148
Tenth anniversary of Apollo 11 moon landing
[NASA-TM-80473] N80-14149
APOLLO 12 FLIGHT
Apollo 12 feldspathic basalts 12031, 12038, and 12072: petrology, comparison
[LA-UR-79-1117] N80-15014
Petrology of the Apollo 12 pigeonite basalt suite
[LA-UR-79-1116] N80-15015
APPROACH
Altitude response of several airplanes during landing approach — including space shuttle
[NASA-TM-80186] N80-14139
APPROPRIATIONS
Press conference: FY 1980 budget
[P79-10182] N80-14968
The NASA FY 1980 budget
[P79-10183] N80-14969
APPROXIMATION
Indicating cones and the intersection principle for tangential approximants in abstract multiplier rules
[CSIR-TWISK-68] N80-14810
Approximate and exact numerical integration of the gas dynamic equations
[NASA-CR-162554] N80-14814
AQUEOUS SOLUTIONS
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220
Basic energy properties of electrolytic solutions database
[LBL-7827] N80-14226
AQUIFERS
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-8431] N80-14533
ARC DISCHARGES
The use of chelates to neutralize defects giving rise to partial discharges in insulating materials other than polyethylene: The particular case of epoxy resins
[PUBL-379] N80-14255
ARC HEATING
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074635] N80-14146
ARC LAMPS
Multiple anode arc lamp system
[NASA-CASE-NPO-10857-1] N80-14330
ARCHITECTURE
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
ARCHITECTURE (COMPUTERS)
A flight control system using the DAIS architecture
N80-14019
Trends in digital data processing and system architecture — avionics applications
N80-14020
A method for designing multiprocessor architectures for avionics functions
N80-14021
COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications
N80-14041
The Megaprocessor: A multiple-processor architecture based upon expression tree pipelining
N80-14759
A regular layout for parallel adders
[AD-A074455] N80-14764
A systematic methodology for designing the architecture of complex software systems
[AD-A074911] N80-14778
ARCTIC OCEAN
Sea breezes on the Alaskan arctic coast
N80-14632
ARCTIC REGIONS
VHF and UHF propagation studies in the Canadian Arctic
[CRC-1327] N80-14288
Arctic Research in Environmental Acoustics [AREA]. Technical report no. 8: Arctic lead-airdrop data buoy
[AD-A074731] N80-14664
ARGON
Post collision interaction in photoexcited argon LMM Auger processes
[IPPJ-422] N80-14912

ARID LANDS
Groundwater resources of the Texas high plains: State-of-the-art and future research needs [PB-298147/0] N80-14469
ARMED FORCES [FOREIGN]
Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF [MRL-R-752] N80-14233
Concerning individual equipment for fighter pilots in the Air Force N80-14735
FRG aircrew chemical defence assemblies N80-14737
ARMED FORCES [UNITED STATES]
Methodology investigation exposure/performance test of selected materiel items — Army equipment in Panama Canal zone [AD-A074001] N80-14406
Philosophy of protection of US aircrews against chemical warfare agents N80-14734
US aircrew chemical defense assemblies N80-14736
ARSENIC COMPOUNDS
Effect of silver on the structure and properties of arsenic-trisulfide glass N80-14247
ARTERIES
The effects of hypodynamia and hypokinesia on the arterial bed of pelvic limb muscles in the rabbit [NASA-TM-75984] N80-14673
ARTIFICIAL INTELLIGENCE
Knowledge-based parsing [AD-A068666] N80-14774
Search. A section of the handbook of artificial intelligence [AD-A074078] N80-14797
ARTIFICIAL SATELLITES
A model for space radar clutter [AD-A072990] N80-14302
ASPHALT
Construction of an ice-retardant overlay — asphalt additive [PB-298876/4] N80-14274
ASTEROIDS
Planetary astronomy — asteroids, planets, and protoplanets [NASA-CR-162526] N80-15003
ASTRONOMICAL CATALOGS
Progress of the HEAO A-1 catalog — all sky map of X-ray sources N80-14979
ASTRONOMICAL MAPS
Progress of the HEAO A-1 catalog — all sky map of X-ray sources N80-14979
ASTRONOMICAL PHOTOGRAPHY
Pioneer Saturn encounter news briefing [NASA-TM-80353] N80-15009
ASTRONOMICAL PHOTOMETRY
Planetary astronomy — asteroids, planets, and protoplanets [NASA-CR-162526] N80-15003
ASTRONOMICAL SPECTROSCOPY
Nondispersive spectroscopy of celestial X-ray sources N80-14993
ASTROPHYSICS
High resolution X-ray spectroscopy on the Einstein Observatory N80-14994
Monitor proportional counter N80-14995
ASYMMETRY
Non-axial-symmetric Alfven waves in cylindrical, radial inhomogeneous plasmas [IPF-78-6] N80-14927
ASYMPTOTIC METHODS
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown [TR-41] N80-14804
ATMOSPHERIC ATTENUATION
Absorption of sound waves in the atmosphere N80-14867
ATMOSPHERIC CHEMISTRY
Aerometric data analysis for the Houston Area Oxidant Study, volume 2 [PB-299648/6] N80-14599
Aerometric data analysis for the Houston Area Oxidant Study, Volume 1: Executive summary [PB-299647/8] N80-14600
Laboratory measurements — for use in stratospheric modelling N80-14642
Models — for the stratosphere N80-14643
Budgets — in determining the physical and chemical state of the stratosphere N80-14644
National report: Meteorology for 1975-1979 — Czechoslovakian activities N80-14649
ATMOSPHERIC CIRCULATION
A box model study for global and regional sulfur circulations N80-14580
Meteor wind over Atlanta, 34 deg north, 84 deg west N80-14623
A statistical analysis of extreme chinooks in Montana as they relate to large scale circulation changes N80-14630
Stochastic modding of the time-averaged equations for climate dynamics [NASA-CR-162527] N80-14652
ATMOSPHERIC COMPOSITION
Rocket ozone sounding network data [NASA-TM-73283] N80-14608
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres [PR-482] N80-15017
Structure of the Mars lower and middle atmosphere based on Mars 5 ultraviolet photometry data [PR-483] N80-15018
ATMOSPHERIC ENTRY SIMULATION
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point [AD-A074635] N80-14146
Galileo probe thermal protection: Entry heating environments and spallation experiments design [NASA-CR-152334] N80-14184
ATMOSPHERIC MODELS
A box model study for global and regional sulfur circulations N80-14580
Imperial Valley environmental project: Air quality assessment [UCRL-52699] N80-14585
Planetary ionospheres N80-14612
The stratosphere: Present and future [NASA-RP-1049] N80-14641
Laboratory measurements — for use in stratospheric modelling N80-14642
Models — for the stratosphere N80-14643
Model predictions — for ozone concentration changes in the atmosphere N80-14648
World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement [WMO-528] N80-14659
ATMOSPHERIC PHYSICS
Meteorology of the stratosphere N80-14646
ATMOSPHERIC PRESSURE
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control [NASA-CASE-NPO-14474-1] N80-14229
ATMOSPHERIC REFRACTION
Fundamentals of sound reflection and refraction in inhomogeneous media — atmospheric propagation N80-14861
ATMOSPHERIC SCATTERING
Analysis of techniques for imaging through the atmosphere — speckle imagery for deep space object identification [AD-A073640] N80-14901
ATMOSPHERIC TIDES
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar [NASA-CR-162555] N80-15025
ATMOSPHERIC TURBULENCE
Effect of spanwise gust variations N80-14639
ATOMIC CLOCKS
Synchronization of clocks in the 100 ps range [ESA-TT-578] N80-14381
ATOMIC COLLISIONS
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency [NASA-CR-162525] N80-14878
Theoretical studies relating to the interaction of radiation with matter: Atomic collision processes occurring in the presence of radiation fields [AD-A074183] N80-14881
ATOMIC ENERGY LEVELS
Ordering of atomic energy levels in excited states [CU-TP-135] N80-14884
ATOMIC EXCITATIONS
Ordering of atomic energy levels in excited states [CU-TP-135] N80-14884
ATOMIC PHYSICS
Theoretical studies relating to the interaction of radiation with matter: Atomic collision processes occurring in the presence of radiation fields [AD-A074183] N80-14881
ATOMIC STRUCTURE
Ordering of atomic energy levels in excited states [CU-TP-135] N80-14884
Catalysis and surface science — study of relationship of atomic structure and catalysis during surface reactions [LBL-9043] N80-14885
ATOMIC THEORY
Capture of muons in atoms [CALT-63-304] N80-14888
ATOMS
The ionization and neutralization of sputtered atoms — study of surface ionization and dependence of sputtered atoms on energy distribution N80-14939
ATS 5
ATS-5 and ATS-6 potentials during eclipse [AD-A074878] N80-14170
ATS 6
ATS-5 and ATS-6 potentials during eclipse [AD-A074878] N80-14170
ATTITUDE CONTROL
Torque equilibrium attitude control for Skylab reentry [NASA-TM-78252] N80-14169
ATTITUDE INDICATORS
Methods for strap-down attitude estimation and navigation with accelerometers N80-14034
ATTITUDE STABILITY
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability [AD-A074947] N80-14171
AUGER SPECTROSCOPY
Post collision interaction in photoexcited argon LMM Auger processes [IPPJ-422] N80-14912
AUSTENITIC STAINLESS STEELS
High strength austenitic alloys for generator retaining rings [EPRI-FP-1061] N80-14239
AUTOCORRELATION
Techniques and benefits of shaping the pulses of binary sequences with application to spread spectrum radio communications [AD-A073964] N80-14322
AUTOIONIZATION
Electron spectra resulting from autoionization in low-energy Li^{+} + He collisions [IPPJ-420] N80-14920
AUTOMATIC CONTROL
Failure detection, isolation and indication in highly integrated digital guidance and control system N80-14027
Radar data utilization in automating the sequencing of aircrafts in terminal areas N80-14071
Automatic systems for airport surface mobile media surveillance based on the use of secondary media N80-14104
Method for forming a solar array strip [NASA-CASE-NPO-13652-3] N80-14474
AUTOMATIC FLIGHT CONTROL
An assessment of and approach to the validation of digital flight control systems N80-14036
Simulation use in the development and validation of HIMAT flight software N80-14039
Pilot control through the TAFCOS automatic flight control system [NASA-TM-81152] N80-14138
AUTOMATIC PILOTS
Pilot control through the TAFCOS automatic flight control system [NASA-TM-81152] N80-14138
AUTOMOBILES
Ambient temperature, fuel economy, emissions, and trip length [PB-298847/5] N80-14976
AVIONICS
Advances in Guidance and Control Systems Using Digital Techniques [AGARD-CP-272] N80-14017
State of the art for digital avionics and controls, 1978 N80-14018
A flight control system using the DAIS architecture N80-14019
Trends in digital data processing and system architecture — avionics applications N80-14020
A method for designing multiprocessor architectures for avionics functions N80-14021
FORTRAN for avionics N80-14022
The avionics computer program: Practical experiences with a methodology — Mirage F1 and Mirage 200 aircraft N80-14037
Avionics installation [AVSTALL] cost model for user equipment of NAVSTAR global positioning system [AD-A073681] N80-14106
AXIAL FLOW TURBINES
Preliminary design of axial flow hydrocarbon turbine/generator set for geothermal applications [EPRI-ER-513] N80-14536
AZIMUTH
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS] N80-14097

The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14102
Calculation of the azimuth of the section between Hohenpeissenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig]
[SER-B-236] N80-14461
AZINES
Two photon spectroscopy of pyrazine and triazine
[AD-A074055] N80-14219

B

B STARS
A study of P Cygni stars — model envelopes of early b-type
N80-13001
BACKGROUND RADIATION
Passive infrared surveillance - new methods of analysis
[AD-A074742] N80-14904
The velocity of clusters of galaxies relative to the microwave background. The possibility of its measurement
[PB-288] N80-15007
BACKSCATTERING
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385
BACTERIA
Investigation of effects of temperature, salinity, and electrode design on the performance of an electrochemical coliform detector
[NASA-TM-80130] N80-14676
BALLOON-BORNE INSTRUMENTS
Proceedings of the 10th AFGL Scientific Balloon Symposium — conference
[AD-A074469] N80-14057
Hard X-ray observation of Cygnus-3
[MPI-PAE/EXTRATERREST-155] N80-15002
BALLOONS
Proceedings of the 10th AFGL Scientific Balloon Symposium — conference
[AD-A074469] N80-14057
BANDPASS FILTERS
Subband coder study
[AD-A074427] N80-14312
BANDWIDTH
A constant percentage bandwidth transform for acoustic signal processing
N80-14280
Image transmission via spread spectrum techniques — synthetic aperture radar
[AD-A074806] N80-14308
Subband coder study
[AD-A074427] N80-14312
BARIUM ION CLOUDS
An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique — experiment planning
[MPI-PAE/EXTRATERREST-152] N80-14621
BASALT
Apollo 12 feldspathic basalts 12031, 12038, and 12072: petrology, comparison
[LA-UR-79-1117] N80-15014
Petrology of the Apollo 12 pigeonite basalt suite
[LA-UR-79-1116] N80-15015
BATHYMETERS
The cost effectiveness of airborne laser hydrography
[PB-295057/0] N80-14668
BATHYTHERMOGRAPHS
Airborne Expendable Bathythermograph [AXBT] observations immediately before and after passage of typhoon PHYLLIS in August of 1975
[AD-A074809] N80-14666
BAYES THEOREM
On Bayes and gamma-minimax subset selection rules
N80-14823
Spectral estimation from irregular arrays
[PB-299363/2] N80-14831
BEAM WAVEGUIDES
Equilibrium and propagation of a rotating relativistic electron beam in the absence of an external guide field
[AD-A074805] N80-14834
BEAMS [RADIATION]
Two FORTRAN programs for the computation of the mono beam pattern of a perturbed array
N80-14780
Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839
BEARING [DIRECTION]
Calculation of the azimuth of the section between Hohenpeissenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig]
[SER-B-236] N80-14461
Randomization procedures for a two way analysis of orientation data — directional orientation in animals
N80-14824
BEARINGS
A study of the influence of oil saturation on the 64 meter antenna hydrostatic bearing grout
N80-14159
BEAUFORT SEA [NORTH AMERICA]
Sea breezes on the Alaskan arctic coast
N80-14632
BEDS [PROCESS ENGINEERING]
Development of the steam-iron process for hydrogen production, 9010
[PE-2435-32] N80-14258
BEHAVIOR
Randomization procedures for a two way analysis of orientation data — directional orientation in animals
N80-14824
BENDING MOMENTS
Biaxial bending analysis of hydraulic cylinders
N80-14409
BETA PARTICLES
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system
[NASA-TM-80179] N80-14771
BIBLIOGRAPHIES
Atmospheric echo sounding. A bibliography with abstracts
[NTIS/PS-0909/8] N80-14626
Current research on aviation weather [bibliography], 1979
[NASA-CR-3214] N80-14651
BINARY SYSTEMS [MATERIALS]
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932
BINOCULAR VISION
A microprocessor-based random-dot stereogram system — for basic research and clinical testing
N80-14768
BIOACOUSTICS
USAF bioenvironmental noise data handbook. Volume 125: F-105D aircraft, near and far-field noise
[AD-A073616] N80-14848
USAF bioenvironmental noise data handbook. Volume 129: F-100 aircraft in the AF32A-16 noise suppressor, near and far-field noise
[AD-A073793] N80-14849
USAF bioenvironmental noise data handbook. Volume 137: F-101B aircraft, near and far-field noise
[AD-A073617] N80-14850
USAF bioenvironmental noise data handbook. Volume 138: F-102A aircraft, near and far-field noise
[AD-A073618] N80-14851
BIOCHEMISTRY
Fusarium species: Their potential for transforming biomass to ethanol
[ANL/EES-TM-38] N80-14271
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants
N80-14686
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes
[NASA-CR-162537] N80-14689
BIODEGRADATION
Fast production of methane by anaerobic digestion, volume 1 — solid waste utilization
[COO-2900-17-VOL-1] N80-14268
Fusarium species: Their potential for transforming biomass to ethanol
[ANL/EES-TM-38] N80-14271
BIODYNAMICS
Measurement of resistive torques in major human joints
[AD-A071170] N80-14695
Modeling biodynamic effects of vibration, fifth year
[AD-A073819] N80-14719
BIOENGINEERING
A controlled rate freeze/thaw system for cryopreservation of biological materials
[NASA-CR-162531] N80-14673
Measurement of resistive torques in major human joints
[AD-A071170] N80-14695
Technologies for the handicapped and the aged
[NASA-TM-80842] N80-14715
BIOLOGICAL EFFECTS
Environment and the quality of life
[EUR-5970] N80-14582
Physiological factors in space operations. Emphasis on space shuttle
N80-14682
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants
N80-14686
BIOMASS
Pilot plant gasification test on biomass fuels
[PB-299077/8] N80-14272
Crop monitoring and prediction using satellite data
N80-14455
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977.
[CNEXO-16-1978] N80-14667
BIOMASS ENERGY PRODUCTION
Fast production of methane by anaerobic digestion, volume 1 — solid waste utilization
[COO-2900-17-VOL-1] N80-14268
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
Biological conversion of biomass to methane
[COO-2917-12] N80-14270
Fusarium species: Their potential for transforming biomass to ethanol
[ANL/EES-TM-38] N80-14271
BIONICS
Modeling biodynamic effects of vibration, fifth year
[AD-A073819] N80-14719
BIOSYNTHESIS
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes
[NASA-CR-162537] N80-14689
BIOTECHNOLOGY
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes
[NASA-CR-162537] N80-14689
BIRD-AIRCRAFT COLLISIONS
An evaluation of the bird/aircraft strike hazard at Barksdale Air Force Base, Louisiana [SAC]
[AD-A074390] N80-14063
BL LACERTAE OBJECTS
Correlated ground based observations in support of the HEAO-1 X-ray observatory
N80-14988
BLADE TIPS
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615] N80-14049
Laser-optical blade tip clearance measurement system
[NASA-TM-81376] N80-14128
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations — conducted in the Langley V/STOL tunnel
[NASA-TP-1608] N80-14840
BLOCKS
Recent improvements to the ASTM-type ultrasonic reference block system — ultrasonic flaw detection used on aluminum blocks
[AD-A074724] N80-14852
BLOOD
Dialysis system — using ion exchange resin membranes permeable to urea molecules
[NASA-CASE-NPO-14101-1] N80-14687
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes
[NASA-CR-162537] N80-14689
BLOOD CIRCULATION
Modeling of blood flow in vessels of the microcirculation
N80-14685
BLOOD FLOW
Modeling of blood flow in vessels of the microcirculation
N80-14685
Effect of prolonged hypokinesia on tissue blood flow
[NASA-TM-76005] N80-14688
BODIES OF REVOLUTION
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14043
BODY SIZE [BIOLOGY]
Design criteria for characterizing individuals in the extreme upper and lower body size ranges
[AD-A072553] N80-14721
BODY-WING AND TAIL CONFIGURATIONS
High angle of attack characteristics of different fighter configurations
[MBB-UFE-1443[O]] N80-14058
BOILER PLATE
Quiet Clean Short-Haul Experimental Engine [QCSEE]. Under-the-wing [UTW] engine boilerplate Nacelle test report. Volume 2: Aerodynamics and performance
[NASA-CR-135250] N80-14116
BOILERS
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 1
[PB-299191/7] N80-14590
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 2
[PB-299192/5] N80-14591
BOLOMETERS
Antenna-coupled infrared detectors
[AD-A074085] N80-14320
BOOLEAN ALGEBRA
Boolean valued models and Galois theory for commutative regular rings
N80-14832
BORN APPROXIMATION
Molecular reaction rates
[AD-A073851] N80-14882
BOUNDARY LAYER FLOW
Magnus effect on spinning bodies of revolution
N80-14044
BOUNDARY LAYER TRANSITION
Radiated noise due to boundary-layer transition
[AD-A073491] N80-14846

BOUNDARY VALUE PROBLEMS
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-598] N80-14790
Solution of electromagnetic boundary value problems of complicated structures. Theory of the integral equation method
[ESA-TT-596] N80-14820
Mathematical techniques for acoustic propagation problems
N80-14862
BRAIN
Effect of rhythmic photostimulation on monkeys with hyperkinesis of post-encephalitic genesis
[NASA-TM-75998] N80-14674
Brain waves and the enhancement of pilot performance
N80-14751
BREATHING APPARATUS
An advanced oxygen system for future combat aircraft
N80-14680
BRECCIA
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559] N80-15013
BREEDER REACTORS
Outlook for nuclear fusion energy
[CONF-7811126-1] N80-14509
BRINES
Construction and initial operation of the Miamisburg salt-gradient solar pond
[MLM-2626-OP] N80-14541
BRITTLE MATERIALS
Modified Weibull theory for the strength of granular brittle material
[GA-A-15228] N80-14421
BROADBAND
High frequency broadband rotor noise — method to find level of high frequency broadband aircraft noise due to rotary wings
N80-14838
BUBBLE CHAMBERS
Microcomputer-based monitoring and control system
[SLAC-TN-79-3] N80-14798
BUBBLES
An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique — experiment planning
[MPI-PAE/EXTRATERREST-152] N80-14621
BUDGETING
Management Analysis of Key Resource Operations [MAKRO], volume 1
[AD-A069016] N80-14957
Management analysis of Key Resource Operations [MAKRO]. Volume 2, Appendix E: Networks. Annexes 1 and 2: Planning and programming
[AD-A069017] N80-14958
Management Analysis of Key Resource Operations [MAKRO]. Volume 3, Appendix E: Networks. Annex 3: Budget formulation
[AD-A069018] N80-14959
BUFFETING
Flight testing of the buffeting behavior of combat aircraft
[ESA-TT-523] N80-14143
BUILDINGS
A study of fire safety effectiveness statements — buildings
[PB-299169/3] N80-14275
Fire-code inspections and fire prevention: What methods lead to success
[PB-298991/1] N80-14276
Program controlled cartographic generalization of buildings, for 1:25000 topographic maps
N80-14430
BUOYS
Arctic Research in Environmental Acoustics [AREA]. Technical report no. 9: Arctic lead-airdrop data buoy
[AD-A074731] N80-14664
BYPASSES
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-valve controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531] N80-14123

C

CABIN ATMOSPHERES
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
CADMIUM TELLURIDES
Recent investigations of metal oxide/CdTe heterojunction solar cells
[CONF-780619-25] N80-14564
CALCIUM
Study of two-photon absorption and amplification processes in gases
[AD-A074951] N80-14391
CALCIUM FLUORIDES
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
CALIBRATING
Determination of the repeatability of PEC — flight tests for position error calibrating
[AETE-FR-79/36] N80-14109
Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg — Langley 12-foot low speed wind tunnel test
[NASA-TM-80109] N80-14110
Electromagnetic power absorber
[NASA-CASE-NPO-13830-1] N80-14281
CALIFORNIA
Imperial Valley environmental project: Air quality assessment
[UCRL-52699] N80-14585
Crustal deformation in central California: Multi-wavelength geodetic observations and interpretations
N80-14605
CAMBERED WINGS
Separated turbulent flow behind a stalled airfoil
[AAAF-NT-79-12] N80-14059
CAMERAS
Simultaneous multiple camera and multiple focal setting self-calibration in photogrammetry
N80-14372
PEI camera system, acceptance test and checkout procedure, as installed in BQM-34 A/S and BQM-34 E/T
[AD-A074388] N80-14378
CANADA
VHF and UHF propagation studies in the Canadian Arctic
[CRC-1327] N80-14288
CAPILLARIES [ANATOMY]
Modeling of blood flow in vessels of the microcirculation
N80-14685
CARBAMATES [TRADENAME]
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
CARBON DIOXIDE
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074913] N80-14944
CARBON DIOXIDE LASERS
An electron diffraction study of laser excited sulfur hexafluoride
N80-14207
Isometrically deformable synclastic surfaces as flexible waveguides
N80-14335
A cesium TELEC experiment at Lewis Research Center
[NASA-CR-159729] N80-14386
Measurement of the ion profile by stationary CO2 laser scattering from a hydrogen plasma
[IPF-78-5] N80-14926
Light scattering from an arc plasma with stationary CO2 laser and heterodyne detection
[IPF-78-6] N80-14928
CARBON DIOXIDE REMOVAL
Regenerative CO2 removal for PLSS application
[NASA-CR-160419] N80-14718
CARBON FIBER REINFORCED PLASTICS
Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79314] N80-14196
CARBON FIBERS
The transfer of carbon fibers through a commercial aircraft water separator and air cleaner
[NASA-CR-159183] N80-14359
CARBON MONOXIDE
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
Photoemission studies of time-resolved surface reactions: Isothermal desorption of CO from Ni(3)
[AD-A074953] N80-14221
CARBONYL COMPOUNDS
Hydrogenation catalysts derived from Mo[CO]6/alumina
N80-14208
CARBORANE
Carborane synthesis — thermolysis of tetraethyl ammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570] N80-14217
CARTESIAN COORDINATES
Kalman filter processing of position and Doppler radar measurement in coupled Cartesian coordinates
[REPT-274] N80-14459
Three dimensional adjustment of the 'Western Harz' test network
[SER-B-234] N80-14460
CATALYSIS
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
Catalysis and surface science — study of relationship of atomic structure and catalysis during surface reactions
[LBL-9043] N80-14885
CATALYSTS
Hydrogenation catalysts derived from Mo[CO]6/alumina
N80-14208
Catalysis and surface science — study of relationship of atomic structure and catalysis during surface reactions
[LBL-9043] N80-14885
CATHODES
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206
CAVITY RESONATORS
Laser apparatus
[NASA-CASE-GSC-12237-1] N80-14384
CDC STAR 100 COMPUTER
GIM code user's manual for the STAR-100 computer — for generating numerical analogs of the convection laws
[NASA-CR-3157] N80-14354
CELESTIAL BODIES
A-4 scientific results
N80-14985
X-ray emission from the region of gamma 195+5
N80-14986
Optical identification and spectroscopy of X-ray sources precisely positioned with A-3
N80-14991
Speckle interferometry for a partially coherent source
[AD-A074540] N80-15004
CENTRAL PROCESSING UNITS
A method for designing multiprocessor architectures for avionics functions
N80-14021
COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications
N80-14041
CERAMICS
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252
High pressure ceramic heat exchanger. Phase 1: Deadband experimental verification
[COO-4236-3] N80-14364
Contact stress analysis of ceramic-to-metal interfaces — in gas turbine engines
[AD-A074491] N80-14417
CESIUM ENGINES
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines
[ONERA-RTS-1/3127-EY] N80-14195
CHANNEL CAPACITY
Error control systems for multi-access communication channels
[AD-A074569] N80-14314
CHANNEL FLOW
Investigation of coherent structures in the velocity field of a fully developed turbulent channel flow using flow visualization and anemometry
[MPIS-MITT-46] N80-14366
CHANNELS [DATA TRANSMISSION]
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
L-band measurements in the air traffic channel to characterize secondary radar systems
N80-14092
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14101
Robust waveform design
[AD-A074932] N80-14311
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description
[ESA-CR[P]-878-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR[P]-878-VOL-3] N80-14783
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results
[ESA-CR[P]-1228-VOL-1] N80-14784
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description
[ESA-CR[P]-1228-VOL-2] N80-14785
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques
[ESA-CR[P]-1228-VOL-3] N80-14786
CHARGE COUPLED DEVICES
Charge-coupled device architectures for signal processing
N80-14334
Development of charge transfer devices for 1-2 micron imaging
[AD-A074653] N80-14903
CHARGE EXCHANGE
Calculation of total cross sections for charge exchange in molecular collisions
[NASA-CR-162560] N80-14879

Formation of hydrogen negative ions by surface and volume processes with application to negative ion sources
[UCRL-42389] N80-14487
CHARGE TRANSFER DEVICES
A monolithic surface acoustic wave charge transfer device
N80-14437
CHELATES
Preparation and catalytic oxidizing potential of polymer supported chelating amine and Schiff base cobaltous
[AD-A073078] N80-14230
The use of chelates to neutralize defects giving rise to partial discharges in insulating materials other than polyethylene: The particular case of epoxy resins
[PUBL-379] N80-14235
CHEMICAL ANALYSIS
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264
CHEMICAL FRACTIONATION
Methods for calculation of engineering parameters for gas separation — vapor pressure and solubility of gases in organic liquids
[NASA-CR-162532] N80-14211
CHEMICAL LASERS
Kinetic aspects of gas phase metal atom oxidation reactions — laser design
[AD-A074089] N80-14387
CHEMICAL PROPERTIES
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52600] N80-14253
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern
[AD-A074029] N80-14383
CHEMICAL REACTIONS
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
Carbonate synthesis — thermolysis of tetraethyl ammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570] N80-14217
Syntheses and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14246
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4
[CONF-780807-11] N80-14265
CHEMICAL REACTORS
Development of the steam-iron process for hydrogen production, 9010
[PE-2435-32] N80-14258
CHEMICAL WARFARE
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL] N80-14728
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
Approaches to CW agent area detection systems for airfields
N80-14733
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
Concerning individual equipment for fighter pilots in the Air Force
N80-14735
US aircrew chemical defense ensembles
N80-14736
FRG aircrew chemical defence ensembles
N80-14737
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738
CHEMILUMINESCENCE
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
Laser fluorescence studies of chemiluminescent chemical reactions
[AD-A073829] N80-14213
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392
CHEMISORPTION
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14201
CHIPS [MEMORY DEVICES]
Zinc oxide on silicon surface acoustic wave convolvers and memory correlators
N80-14284
CHOLINERGICS
Therapy on nerve agent poisoning
N80-14732
CHOLINESTERASE
The effects of acute and chronic low dose exposure to anticholinesterases
N80-14729
The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment
N80-14731
Therapy on nerve agent poisoning
N80-14732
CHROMIUM
Thermal aging characteristics of electrodeposited black chrome solar coatings
[SAND-78-2094C] N80-14527
Studies of directly absorbing fluids for mid-temperature solar thermal applications
[MLM-2625-OP] N80-14540
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
CIRCUIT BOARDS
Test specification for two-sided printed circuit boards [gold plated finish]
[ESA-PSS-05/QRM-10E-ESTEC-ISS-2] N80-14350
CIRCUIT DIAGRAMS
A regular layout for parallel adders
[AD-A074455] N80-14764
Microcomputer-based monitoring and control system
[SLAC-TN-79-3] N80-14798
CIRCULAR CONES
The calculation of inviscid separated flow about a slender cone for large angles of attack
[RAE-TR-2009] N80-14360
CIRCULAR CYLINDERS
Stretching the circular cylindrical elastic sheet
N80-14800
CITIES
Barriers to the application of wind energy conversion systems in urban settings
N80-14494
Commercialization strategy report for energy from urban wastes
[TID-28852-DRAFT] N80-14521
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790373-1] N80-14562
Urban-rural insolation correlation study — air pollution over metropolitan St. Louis
[DOE/ET-0092] N80-14618
CLASSIFICATIONS
Investigation of security classifications for secure information flow
[REPT-275] N80-14766
CLASSIFYING
The decomposition of mixtures and classification using the gradient technique — an approach to pattern recognition
[BMVG-FBWT-79-07] N80-14799
CLIMATE
Stochastic modeling of the time-averaged equations for climate dynamics
[NASA-CR-162527] N80-14652
CLIMATOLOGY
National report: Meteorology for 1975-1979 — Czechoslovakian activities
N80-14649
CLINICAL MEDICINE
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385
CLOSED ECOLOGICAL SYSTEMS
Biological systems for human life support: Review of the research in the USSR
[NASA-TM-76018] N80-14717
CLOUD PHOTOGRAPHS
Practical exercise on the analysis of visible and infrared images from NOAA-5
N80-14453
CLUMPS
Clustering algorithm evaluation and the development of a replacement for procedure 1 — for crop inventories
[NASA-CR-160434] N80-14772
CLUTTER
Experimental campaign for the analysis of dynamic clutter: The data acquisition system
N80-14078
Experimental campaign for the analysis of dynamic clutter: Processing of recorded data
N80-14079
Dynamic clutter reduction techniques with moving target indicated adaptive filters
N80-14080
A model for space radar clutter
[AD-A072990] N80-14302
COAL
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423
Energy from the West: Energy resource development systems report. Volume 2: Coal
[PB-299178/4] N80-14464
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-298473/0] N80-14595
COAL GASIFICATION
High-BTU coal gasification processes
[ANL/CES/TE-79-2] N80-14263
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
COAL LIQUEFACTION
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264
COAL UTILIZATION
Status of the DOE/NASA critical gas turbine research and technology project
[NASA-TM-79307] N80-14493
Environmental options for coal use
[LA-UR-79-1393] N80-14584
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 1
[PB-299191/7] N80-14590
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 2
[PB-299192/5] N80-14591
COASTS
Sea breezes on the Alaskan arctic coast
N80-14632
COATINGS
Abradable compressor and turbine seals, volume 1 — for turbofan engines
[NASA-CR-159600] N80-14235
Procedure for the formation of a coating on an electrode by polymerization by luminescent discharge
[NASA-TM-75926] N80-14248
COBALT ALLOYS
Corrosion resistance of sodium sulfate coated cobalt-chromium-aluminum alloys at 900 C, 1000 C, and 1100 C
[NASA-TM-79311] N80-14234
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
COBALT 60
Gamma energy spectra for the RADC/ES cobalt 60 source
[AD-A073557] N80-14891
COCKPITS
Vocabulary specification for automatic speech recognition in aircraft cockpits
[AD-A073703] N80-14303
COEFFICIENT OF FRICTION
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
COHERENT RADAR
Performance evaluation of a coherent chain in transmission
N80-14083
COLD WORKING
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U] N80-14413
COLLISION AVOIDANCE
Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105
COLLISION PARAMETERS
Calculation of total cross sections for charge exchange in molecular collisions
[NASA-CR-162560] N80-14879
COLLOCATION
Three dimensional adjustment of the 'Western Harz' test network
[SER-B-234] N80-14460
COLLOIDS
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252
COLORADO
Deep terrestrial heat flow measurements in New Mexico and neighboring geologic areas
[PB-299489/5] N80-14471
COLUMNS [SUPPORTS]
Optical rotating column
[CSIR-TWISK-79] N80-14401
COMBAT
Navy combat search and rescue
[AD-A074593] N80-14062
Aircrew performance research opportunities using the Air Combat Maneuvering Range [ACMR]
N80-14753
COMBUSTION CHAMBERS
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines
[NASA-TP-1582] N80-14125
Measurement of fluid motion in a diesel engine cylinder by use of a tracer gas technique
N80-14399
COMBUSTION EFFICIENCY
Assessment of in situ diagnostics for application to rocket propulsion problems
[AD-A073520] N80-14190
COMBUSTION PHYSICS
Assessment of in situ diagnostics for application to rocket propulsion problems
[AD-A073520] N80-14190

COMBUSTION PRODUCTS
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code
[AD-A074914] N80-14193
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2
[AD-A073871] N80-14194
Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79314] N80-14196
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211] N80-14267
COMMAND AND CONTROL
Simulation of communications protocols for a tactical radar network. Part 1: Executive summary
[AD-A074157] N80-14318
A network graphical conferencing system
[AD-A074610] N80-14779
COMMERCE
Commercialization strategy report for energy from urban wastes
[TID-28852-DRAFT] N80-14321
Commercialization strategy report for electric and hybrid vehicles
[TID-28858-DRAFT] N80-14972
COMMERCIAL AIRCRAFT
The transfer of carbon fibers through a commercial aircraft water separator and air cleaner
[NASA-CR-159183] N80-14359
COMMERCIAL ENERGY
Commercial solar augmented heat pump system
[EPRI-ER-1004] N80-14537
COMMUNICATION CABLES
Recent advances in fibre optics for high integrity digital control systems
N80-14025
COMMUNICATION EQUIPMENT
Special passive components for circular waveguides
N80-14297
Earth terminal subsystem study. Volume 1: Small terminal cost analysis — radio equipment
[AD-A073429] N80-14305
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers
[AD-A073356] N80-14306
COMMUNICATION NETWORKS
Capacity allocation techniques in a multi-user satellite system
[AD-A074018] N80-14310
AFOSR Workshop in Communication Theory and Applications
[AD-A074298] N80-14313
Error control systems for multi-access communication channels
[AD-A074569] N80-14314
Simulation of communications protocols for a tactical radar network. Part 1: Executive summary
[AD-A074157] N80-14318
COMMUNICATION SATELLITES
Capacity allocation techniques in a multi-user satellite system
[AD-A074018] N80-14310
COMMUNICATION THEORY
AFOSR Workshop in Communication Theory and Applications
[AD-A074298] N80-14313
A cost optimal solution for deadlocked processes
[REPT-273] N80-14794
COMPARISON
Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086
COMPILERS
Bootstrapping for a BCPL compiler
[REPT-271] N80-14792
COMPONENT RELIABILITY
The CF6 jet engine performance improvement: New front mount
[NASA-CR-159639] N80-14127
Estimating structural integrity of Type 304 stainless steel plates and pipes containing small defects
[CONF-790802-11] N80-14238
COMPOSITE MATERIALS
Protective coatings for aircraft composites in nuclear environments
[AD-A074189] N80-14199
COMPOSITE STRUCTURES
Feasibility of SiC composite structures for 1644 K [2500 F] gas turbine seal application
[NASA-CR-159597] N80-14122
COMPRESSED AIR
Compressed air energy storage technology program — concept for supplying electric power to meet peak load demands
[PNL-2935] N80-14534
COMPRESSOR ROTORS
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323] N80-14050
Efficient laser anemometer for intra-rotor flow mapping in turbomachinery
[NASA-TM-79320] N80-14375
COMPRESSORS
Abradable compressor and turbine seals, volume 1 — for turbofan engines
[NASA-CR-159600] N80-14235
COMPUTATION
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[RAE-TR-2021] N80-14376
COMPUTATIONAL FLUID DYNAMICS
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3210] N80-14047
COMPUTER GRAPHICS
Graphical processing of areal related data. Program development done in Nordrhein-Westfalen
N80-14429
A network graphical conferencing system
[AD-A074610] N80-14779
COMPUTER INFORMATION SECURITY
The integrity of onboard computer programs: A solution
N80-14028
Investigation of security classifications for secure information flow
[REPT-275] N80-14766
COMPUTER NETWORKS
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission
N80-14030
A communication problem in a computer network
[REPT-272] N80-14793
COMPUTER PROGRAMMING
Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072
Graphical processing of areal related data. Program development done in Nordrhein-Westfalen
N80-14429
Program controlled cartographic generalization of buildings, for 1:25000 topographic maps
N80-14430
An interactive editor for cartographic data
N80-14431
OVPREC: A program automatic recognition of overlapping zones of broadened cartographic line elements
N80-14432
An algorithm for the linearization of raster images for minicomputers
N80-14439
FORTRAN subroutines for cut-of-core solutions of large complex linear systems
[NASA-CR-159142] N80-14773
Image processing system software. Volume 2: Programming manual
[AD-A073653] N80-14776
A systemsomatic methodology for designing the architecture of complex software systems
[AD-A074911] N80-14778
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-598] N80-14790
A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments
[NASA-CR-162557] N80-14791
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
COMPUTER PROGRAMS
The integrity of onboard computer programs: A solution
N80-14028
The avionics computer program: Practical experiences with a methodology — Mirage F1 and Mirage 200 aircraft
N80-14037
Modification of axial compressor streamline program for analysis of engine test data
[NASA-TM-79312] N80-14051
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom
[NASA-TM-80153] N80-14055
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133
Linear systems analysis program, L224[QR]. Volume 1: Engineering and usage
[NASA-CR-2861] N80-14137
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code
[AD-A074914] N80-14193
Design of the transmission media of circular waveguides
N80-14295
GIM code user's manual for the STAR-100 computer — for generating numerical analogs of the conversion laws
[NASA-CR-3157] N80-14354
Development of a three-dimensional supersonic inlet flow analysis
[NASA-CR-3218] N80-14356
SCANLINE: A computer program for converting raster maps into line maps
[CSIR-TWISK-43] N80-14426
A program for the design of geographical maps
N80-14438
Computer program for assessing the economic feasibility of solar energy for single family residences and light commercial applications
[NASA-TM-78251] N80-14501
HELIOS and nonconcentrators — computer program for simulation of solar collectors, concentrators, and heliostats
[SAND-78-1600C] N80-14537
Modeling biodynamic effects of vibration, fifth year
[AD-A073819] N80-14719
Baseline software data system. Volume 1: System description
[AD-A073358] N80-14761
Baseline software data system. Volume 2: Database reference manual
[AD-A073359] N80-14762
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system
[NASA-TM-80179] N80-14771
A computer program for estimation of parameters of the Weibull intensity function and for the Cramer-Von Mises goodness of fit test
[AD-A074764] N80-14777
A systemsatic methodology for designing the architecture of complex software systems
[AD-A074911] N80-14778
Two FORTRAN programs for the computation of the mean beam pattern of a perturbed array
N80-14780
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description
[ESA-CR(P)-878-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR(P)-878-VOL-3] N80-14783
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description
[ESA-CR(P)-1228-VOL-2] N80-14785
'PROCOPES'. [Conversational program for signal analysis]: Evelvement of an interpretative control language
[ESA-TT-581] N80-14788
A new test for multivariate normality and homoscedasticity
[CSIR-TWISK-45] N80-14808
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
US ROLAND 2 Logistics Model [ROLOG]: User's guide
[AD-A074449] N80-14960
COMPUTER SYSTEMS DESIGN
Experience in producing software for the ground station of a remotely piloted helicopter system
N80-14038
Simulation use in the development and validation of HiMAT flight software
N80-14039
Federated microcomputer systems for on-board missile guidance and control
N80-14040
Software design specification. Part 2: Orbital Flight Test [OFT] detailed design specification. Volume 3: Applications. Book 2: System management
[NASA-CR-160389] N80-14175
Flight Design System-1 System Design Document. Volume 9: Executive logic flow, program design language
[NASA-TM-80841] N80-14180
COMPUTER SYSTEMS PROGRAMS
An assessment of and approach to the validation of digital flight control systems
N80-14036
Analysis of logical ripple effect of program modification
N80-14769
Image processing system software. Volume 1: Users manual
[AD-A073652] N80-14775
Image processing system software. Volume 2: Programming manual
[AD-A073653] N80-14776
Bootstrapping for a BCPL compiler
[REPT-271] N80-14792
COMPUTER TECHNIQUES
FORTRAN for avionics
N80-14022
Atlanta Air Route Traffic Control Center's involvement in aviation weather
N80-14637
Assessment of technology for information services planning
[AD-A073315] N80-14963

COMPUTERIZED DESIGN
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159180] N80-14054
Synthesis of linear array radiation patterns
N80-14090
A computer-aided design system for custom large-scale integrated circuits
N80-14138
Design of the transmission media of circular waveguides
N80-14200
Information on cartography and geodesy. Series 1: Original report number 75
N80-14427
A program for the design of geographical maps
N80-14438
COMPUTERIZED SIMULATION
Simulation use in the development and validation of HIMAT flight software
N80-14039
Simulation of a surveillance and control system of surface traffic in an airport
N80-14073
Performance evaluation of a coherent chain in transmission
N80-14083
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
Pilot control through the TAFCOS automatic flight control system
[NASA-TM-81152] N80-14138
An analysis of external burning propulsion
[AD-A074639] N80-14192
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 2: User's guide to computer EMA model
[NASA-CR-160356] N80-14340
Dynamic energy system optimization model — study of computerized simulation domestic energy models
[EPRI-EA-1079] N80-14514
HELIOS and reconcentrator — computer program for simulation of solar collectors, concentrators, and heliostats
[SAND-78-1680C] N80-14557
Time simulation of an air surveillance task with varying amounts of radar information
[AD-A074066] N80-14722
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Self-study guide
[PB-299256/9] N80-14723
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/7] N80-14724
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 1
[PB-299305/5] N80-14725
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 2
[PB-299306/3] N80-14726
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 3
[PB-299307/1] N80-14727
A simple procedure for simulation of homogeneous Markhov chains on a computer
[ESA-TT-529] N80-14787
Simulation and real-time system design: An integrated approach
N80-14795
A model for the computational determination of parameter values of anthropomorphic segments
[CSIR-TWISK-79] N80-14807
Contribution Monte Carlo — for calculating target response
[LA-7849-MS] N80-14817
CONCENTRATION [COMPOSITION]
Volatile organic compounds in seawater — sources and transport mechanisms
[AD-A074179] N80-14214
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry
[AD-A074038] N80-14216
Budgets — in determining the physical and chemical state of the stratosphere
N80-14644
Model predictions — for ozone concentration changes in the atmosphere
N80-14648
CONCENTRATORS
Solar concentrator
[NASA-CASE-MFS-23727-1] N80-14473
HELIOS and reconcentrators — computer program for simulation of solar collectors, concentrators, and heliostats
[SAND-78-0480C] N80-14557
CONCORDE AIRCRAFT
Supersonic aerial transport: Medical and physiological aspects — Concorde aircraft
N80-14683
CONCRETES
Construction of an ice-resistant overlay — asphaltic additive
[PB-299876/4] N80-14276
Complete stress-strain curve of concrete and nonlinear design
[PB-299151/1] N80-14277
CONDUCTIVE HEAT TRANSFER
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems
[NASA-CR-162936] N80-14042
CONFERENCES
Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017
Proceedings of the 10th AFGL Scientific Balloon Symposium — conferences
[AD-A074469] N80-14057
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Anniversary of Apollo 11 moon landing press conference
[NASA-TM-80844] N80-14148
Tenth anniversary of Apollo 11 moon landing
[NASA-TM-80677] N80-14149
Press conference on Skylab
[NASA-TM-80755] N80-14167
Press briefing: MAGSAT — conferences
[NASA-TM-80757] N80-14168
Press briefing on Dr. Frosch's meeting with President Carter regarding the space shuttle — conferences
[NASA-TM-80753] N80-14174
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264
AFOSR Workshop in Communication Theory and Applications
[AD-A074298] N80-14313
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-9431] N80-14533
Fifth Ocean Thermal Energy Conversion Conference, volume 2, sections 4-5
[CONF-780236-P2] N80-14553
Fifth Ocean Thermal Energy Conversion Conference, volume 3, sections 6-7
[CONF-780236-P3] N80-14554
Fifth Ocean Thermal Energy Conversion Conference, volume 1, sections 1-3
[CONF-780236-P1] N80-14555
Proceedings of the DOE chemical/hydrogen energy contractor review system
[CONF-771131] N80-14572
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionosphere. Conference, Germany Jul. 1975
[REPT-55/1977] N80-14609
Proceedings of Second International Symposium on Problems Related to the Redefinition of North American Geodetic Networks — conferences
[PB-299260/6] N80-14623
Meteorology for Solar Energy Applications — conferences
[ISSN-0306-7874] N80-14631
Proceedings, Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems
[NASA-CP-2100] N80-14633
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX
[GARP-SPEC-REPT-32] N80-14656
Workshop on Adaptive Control
[AD-A072723] N80-14796
West Coast Forum on Appropriate Technology — research in energy and environmental areas
[PB-299086/1] N80-14962
HEAO Science Symposium
[NASA-CP-2113] N80-14977
News conference on Voyager-2-Jupiter encounter
[NASA-TM-80856] N80-15008
CONGRESSIONAL REPORTS
Severe storms research — congressional reports
[GPO-53-135] N80-14650
Technologies for the handicapped and the aged
[NASA-TM-80842] N80-14715
The Space Industrialization Act of 1979
[GPO-50-406] N80-14970
CONICAL NOZZLES
Acoustic considerations of flight effects on jet noise suppressor nozzles
[NASA-TM-81377] N80-14843
CONSERVATION LAWS
GIM code user's manual for the STAR-100 computer — for generating numerical analogs of the conversion laws
[NASA-CR-3157] N80-14354
CONSTRAINTS
Barriers to the application of wind energy conversion systems in urban settings
N80-14494
CONSTRUCTION INDUSTRY
Environmental assessment of construction grants projects — environmental impact
[PB-299209/7] N80-14597
CONSTRUCTION MATERIALS
Complete stress-strain curve of concrete and nonlinear design
[PB-299151/1] N80-14277
Hazardous properties and environmental effects of materials used in Solar Heating and Cooling [SHAC] technologies: Interim handbook
[DOE/EV-0028] N80-14565
Evaluation of alternate vanadium compounds for use in fiberglass reinforced plastic soil surfacing
[AD-A074871] N80-14615
CONTAMINANTS
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern
[AD-A074829] N80-14583
CONTAMINATION
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TOC code
[AD-A074914] N80-14193
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2
[AD-A073871] N80-14194
CONTINENTAL SHELVES
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-A: Compendium of work element reports
[PB-299686/9] N80-14588
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-B: Compendium of work element reports
[PB-299687/7] N80-14589
CONTINGENCY
Categorical data models for complex sampling schemes — contingency tables
N80-14827
CONTINUOUS WAVE LASERS
Laser power meter intercomparison test evaluated by two variable linear regression analysis
[AD-A074526] N80-14389
An algebraic model of adaptive optics for continuous-wave thermal blooming
[AD-A074741] N80-14906
CONTOURS
Non-contacting electro-optical contouring of helicopter rotor blades
[AD-A070805] N80-14111
CONTRACT MANAGEMENT
Assessing the output of Federal commercially directed R/D
[PB-299228/7] N80-14961
CONTROL
Linear systems analysis program, L224[QR]. Volume 1: Engineering and usage
[NASA-CR-2961] N80-14137
CONTROL CONFIGURED VEHICLES
Redundancy management considerations for a control-configured fighter aircraft triplex digital fly-by-wire flight control system
N80-14026
CONTROL SIMULATION
A flight control system using the DAIS architecture
N80-14019
CONTROL THEORY
Application of discrete guidance and control theory
[AD-A074782] N80-14172
CONTROLLABILITY
Pilot control through the TAFCOS automatic flight control system
[NASA-TM-81152] N80-14138
CONTROLLERS
Power factor controller
[NASA-TM-80755] N80-14479
Development and testing of the Junkeeper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78244] N80-14495
Development and testing of the Rho Sigma Incorporated microprocessor control subsystem
[NASA-TM-78246] N80-14496
CONVECTIVE FLOW
An experimental study of natural convection heat transfer in vertical porous media
N80-14352
Langmuir circulation as a convective instability mechanism and its effect on the ocean mixed layer
N80-14662
CONVECTIVE HEAT TRANSFER
An experimental study of natural convection heat transfer in vertical porous media
N80-14352
Visualization of natural convection in flat plate solar collectors
N80-14476
Development, testing and certification of the sigma research, mini-therm-S-101 thermosyphon heat exchanger
[NASA-TM-78245] N80-14499
CONVEXITY
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819

COOLING FINS
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188] N80-14046
COOLING SYSTEMS
Evaluation of performance enhancement of solar powered absorption chiller with an improved control strategy using the BNL-built hardware simulator
[BNL-36218] N80-14552
Ozonation of cooling tower waters
[NASA-CASE-NPO-14340-1] N80-14579
COORDINATE TRANSFORMATIONS
Generalization algorithms
N80-14435
COPOLYMERS
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-162542] N80-14486
COPPER
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074635] N80-14146
The electron-phonon interaction spectrum in proximity effect copper
N80-14937
COPPER ALLOYS
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932
CORRECTION
Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg — Langley 12-foot low speed wind tunnel test
[NASA-TM-80189] N80-14110
CORRELATION
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
Assessment correlates of workload and performance
N80-14758
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown
[TR-41] N80-14804
CORRELATORS
Zinc oxide on silicon surface acoustic wave convolvers and memory correlators
N80-14284
CORROSION
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220
CORROSION PREVENTION
Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF
[MRL-R-752] N80-14233
Ozonation of cooling tower waters
[NASA-CASE-NPO-14340-1] N80-14579
CORROSION RESISTANCE
Corrosion resistance of sodium sulfate coated cobalt-chromium-aluminum alloys at 900 C, 1000 C, and 1100 C
[NASA-TM-79311] N80-14234
COSMIC RAYS
Plasma physics of trapping of cosmic rays around supernova
[PPPL-1558] N80-15034
COST ANALYSIS
Problems related to the design and construction of a radar network
N80-14066
Avionics installation [AVSTALL] cost model for user equipment of NAVSTAR global positioning system
[AD-A073681] N80-14106
Target missile airframe costs
[AD-A073316] N80-14112
COST EFFECTIVENESS
A cost optimal solution for deadlocked processes
[REPT-273] N80-14794
COST ESTIMATES
Study of turboprop systems reliability and maintenance costs
[NASA-CR-135192] N80-14129
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
Functional design specification: NASA form 1510
[NASA-CR-162513] N80-14955
COUNTERS
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
COUPLERS
Special passive components for circular waveguides
N80-14297
COUPLINGS
Coupling device for moving vehicles
[NASA-CASE-GSC-12322-1] N80-14398
COVARIANCE
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown
[TR-41] N80-14804
A new test for multivariate normality and homoscedasticity
[CSIR-TWISK-45] N80-14808
COWLINGS
Quiet Clean Short-Haul Experimental Engine [QCSEE] Under-The-Wing [UTW] graphite/PMR cowl development
[NASA-CR-135279] N80-14119
CRACK INITIATION
A study of surface zone deterioration of nickel leading to fatigue crack initiation in low cycle fatigue
N80-14412
Cumulative damage under two level cycling, some theoretical predictions and test data
[AD-A074488] N80-14418
CRACK PROPAGATION
An X-ray study of the region around static and fatigue cracks
N80-14411
Cumulative damage under two level cycling, some theoretical predictions and test data
[AD-A074488] N80-14418
CRACKING [FRACTURING]
Reflection cracking of bituminous overlays for airport pavements: A state of the art
[AD-A073486] N80-14344
CREEP RUPTURE STRENGTH
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop — methodology for structural design criteria for time temperature functions for creep rupture strength
[EPRI-FP-1063-VOL-1] N80-14825
CREEP TESTS
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240
CRITERIA
Problems related to medical criteria for the selection of military navigation personnel
N80-14679
CROP GROWTH
Overview of agrometeorology — influence of meteorological parameters on crop growth
N80-14441
The agro-ecological zones project — agroclimatic and land suitability assessment for various crops
N80-14445
Crop weather models: Concepts and applications
N80-14450
Crop monitoring and prediction using satellite data
N80-14455
CROP IDENTIFICATION
Remote sensing applied to agriculture
N80-14446
CROP INVENTORIES
Remote sensing applied to agriculture
N80-14446
Crop monitoring and prediction using satellite data
N80-14455
Clustering algorithm evaluation and the development of a replacement for procedure 1 — for crop inventories
[NASA-CR-160424] N80-14772
CRUDE OIL
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
Energy from the West: Energy resource development systems report. Volume 5: Oil and natural gas
[PB-299181/5] N80-14467
CRUSTAL FRACTURES
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603
Crustal deformation in central California: Multi-wavelength geodetic observations and interpretations
N80-14605
CRYOGENIC FLUID STORAGE
Low temperature latching solenoid — cryogenic fluid storage and flow control
[NASA-CASE-MSC-18106-1] N80-14338
CRYOGENIC WIND TUNNELS
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188] N80-14046
Thermodynamic properties of nitrogen gas derived from measurements of sound speed — for cryogenic wind tunnels
[NASA-RP-1051] N80-14257
CRYOGENICS
A controlled rate freeze/thaw system for cryopreservation of biological materials
[NASA-CR-162531] N80-14675
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074913] N80-14944
CRYSTAL STRUCTURE
Grain boundary structure and properties
[COO-5002-3] N80-14947
CUMULATIVE DAMAGE
Cumulative damage under two level cycling, some theoretical predictions and test data
[AD-A074488] N80-14418
CURRENT CONVERTERS [AC TO DC]
Bi-directional four quadrant [BDQ4] power converter development
[NASA-CR-159660] N80-14480
CURRENT DISTRIBUTION
Synthesis of linear array radiation patterns
N80-14090
CURVATURE
Sonic-boom wave-front shapes and curvatures associated with maneuvering flight
[NASA-TP-1611] N80-14045
Vacuum polarization in curved spacetime — stress tensor determination
N80-14951
CURVE FITTING
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR[P]-878-VOL-3] N80-14783
Global saddle-point theorems involving conjugate-like operators, for general and quasi-concave programs
[CSIR-TWISK-72] N80-14811
CYCLIC COMPOUNDS
Conductive polymers consisting of partially oxidized, face-to-face linked metallomacrocycles
[AD-A074538] N80-14251
CYCLIC LOADS
Characteristics of disc springs in combination [to be used in conjunction with item no. 78043]
[ESDU-79010] N80-14396
CYCLONES
World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement
[WMO-523] N80-14659
CYCLOTRON RESONANCE
Nonlinear shift of resonance velocity in interactions between particles and plasma cyclotron waves
[IPPJ-421] N80-14916
CYCLOTRON RESONANCE DEVICES
An examination of ancillary equipment for a proposed 34.3 GHz high power gyrotron TWT amplifier
N80-14156
CYGNUS CONSTELLATION
Hard X-ray observation of Cygnus-3
[MPI-PAE/EXTRATERREST-155] N80-15002
CYLINDRICAL BODIES
On the question of instabilities upstream of cylindrical bodies
[NASA-CR-3231] N80-14357
Biaxial bending analysis of hydraulic cylinders
N80-14409
CZECHOSLOVAKIA
National report: Meteorology for 1975-1979 — Czechoslovakian activities
N80-14640

D

DASSAULT AIRCRAFT
The avionics computer program: Practical experiences with a methodology — Mirage F1 and Mirage 200 aircraft
N80-14037
DATA ACQUISITION
Experimental campaign for the analysis of dynamic clutter: The data acquisition system
N80-14078
The Deep Space Network
[NASA-CR-162524] N80-14150
Voyager mission support
N80-14153
Pioneer 11 Saturn encounter mission support
N80-14154
Real-time ISEE data system
[NASA-CR-162549] N80-14173
Information on cartography and geodesy. Series 1: Original report number 75
N80-14427
An algorithm for the linearization of raster images for minicomputers
N80-14439
The Earthnet programme — for the acquisition and distribution of LANDSAT satellite data
N80-14444
Meteorology of the stratosphere
N80-14646
Analog and digital hardware development for a microcomputer controlled data acquisition system for acoustical imaging
[AD-A074446] N80-14763
DATA BASES
Basic energy properties of electrolytic solutions database
[LBL-7827] N80-14226
An interactive editor for cartographic data
N80-14431
Establishment of a data base of the administrative boundaries of Germany, scale 1:500,000 to 1:1,000,000
N80-14434

Three types of geographic data structure: Similitudes, differences, and possible synthesis
N80-14436
Geographic information systems: A review, with discussion of future developments
N80-14437
Baseline software data system. Volume 1: System description
[AD-A073358] N80-14761
Baseline software data system. Volume 2: Database reference manual
[AD-A073359] N80-14762
The IMS Data Storage Hierarchy: DSH-1
[AD-A073375] N80-14965
The IMS data storage hierarchy: DSH-2
[AD-A073376] N80-14966
DATA COLLECTION PLATFORMS
Meteosat and remote sensing application
N80-14448
DATA LINKS
Pioneer 11 Saturn encounter mission support
N80-14154
DATA MANAGEMENT
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
The air quality data handling system user's guide
[PB-298996/8] N80-14592
The IMS data storage hierarchy: DSH-2
[AD-A073376] N80-14966
DATA PROCESSING
A distributed processing system for radar data presentation
N80-14075
Experimental campaign for the analysis of dynamic clutter: Processing of recorded data
N80-14079
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14101
DSN radio science system, Mark III-80
N80-14152
Information on cartography and geodesy. Series 1: Original report number 75
N80-14427
Program controlled cartographic generalization of buildings, for 1:25000 topographic maps
N80-14430
Cartographic automation status in a German hydrographic institute
N80-14433
Generalization algorithms
N80-14435
DATA RECORDING
Experimental campaign for the analysis of dynamic clutter: The data acquisition system
N80-14078
DATA REDUCTION
Excitation and analysis technique for flight flutter tests
[MBB-UF-1446[O]] N80-14140
Crop environment monitoring: The assessment of environmental phenomena using satellite remote sensing data
N80-14434
DATA RETRIEVAL
Geographic information systems: A review, with discussion of future developments
N80-14437
DATA SAMPLING
Comparison of regression, difference and ratio estimates in sample theory
[GMD-MITT-42] N80-14818
Categorical data models for complex sampling schemes — contingency tables
N80-14827
Spectral estimation from irregular arrays
[PB-299361/7] N80-14831
DATA STORAGE
Spatial data management system
[AD-A068063] N80-14964
The IMS Data Storage Hierarchy: DSH-1
[AD-A073375] N80-14965
DATA SYSTEMS
The Deep Space Network
[NASA-CR-162524] N80-14150
DSN radio science system, Mark III-80
N80-14152
Three types of geographic data structure: Similitudes, differences, and possible synthesis
N80-14436
DATA TRANSMISSION
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission
N80-14030
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase 1
[NASA-CR-159453] N80-14182
DECISION MAKING
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
DECISION THEORY
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702
Optimal selection from a random sequence with observation errors — for the assessment of mineral rights or industrial equipment options
[CSIR-TWISK-69] N80-14829
DECODING
An efficient program for decoding the [295,223] Reed-Solomon code over GF [2 to the 8th power] with both errors and erasures, using transform decoding
N80-14161
DEEP SCATTERING LAYERS
Underwater sound scattering by marine organisms. A review — sonar interference
[MRL-R-756] N80-14841
DEEP SPACE
Analysis of techniques for imaging through the atmosphere — speckle imagery for deep space object identification
[AD-A072640] N80-14901
DEEP SPACE NETWORK
The Deep Space Network
[NASA-CR-162524] N80-14150
Network functions and facilities
N80-14151
DEFECTS
Measurement and characterization of manufacturing and installation imperfections of circular waveguides
N80-14299
DEFENSE COMMUNICATIONS SATELLITE SYSTEM
Earth terminal subsystem study. Volume 1: Small terminal cost analysis — radio equipment
[AD-A073429] N80-14305
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers
[AD-A073356] N80-14306
DEFLECTION
Gravimetric vertical deflection determination for the North Sea regions [GVDNS 1] — study of free atmosphere gravity anomalies
[SER-B-235] N80-14622
DEFLECTORS
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11428] N80-14908
DEFORMATION
Measurement and characterization of manufacturing and installation imperfections of circular waveguides
N80-14299
Unified formalism of strain and stress
[CSIR-TWISK-77] N80-14414
DEGREES OF FREEDOM
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom
[NASA-TM-80153] N80-14055
DELTA WINGS
Separated turbulent flow behind a stalled airfoil
[AAAF-NT-79-12] N80-14059
DEMODULATORS
Stability of the multineghbit telemetry carrier loop
N80-14153
DENSE PLASMAS
Stability of high density plasma in a multiple mirror
[IPPJ-418] N80-14914
DENSITY [MASS/VOLUME]
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211] N80-14267
DENSITY MEASUREMENT
Air traffic density and distribution measurements
[AD-A073229] N80-14064
DEPLOYMENT
Antenna deployment mechanism for use with a spacecraft — extensible and retractable telescopic antenna mast
[NASA-CASE-GSC-12331-1] N80-14183
DESIGN ANALYSIS
Problems related to the design and construction of a radar network
N80-14066
Performance evaluation of a coherent chain in transmission
N80-14083
The influence of transmitter stability on primary radar performance
N80-14084
Preliminary analysis and selection criteria for an antenna for a secondary radar system
N80-14091
Monopulse receiver performance in SSR and DABS systems
N80-14093
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14101
A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14102
General criteria for the design of repeating stations of circular waveguide systems
N80-14296
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162544] N80-14484
Investigation of effects of temperature, salinity, and electrode design on the performance of an electrochemical coliform detector
[NASA-TM-80130] N80-14676
DESORPTION
Photoemission studies of time-resolved surface reactions: Isothermal desorption of CO from Ni(3
[AD-A074953] N80-14221
DETERIORATION
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
DETONATION
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211] N80-14267
DETONATION WAVES
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
DEUTERIUM
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K
[AD-A074264] N80-14215
Enhancement of D-T reaction rate due to D-T contact
[IPPJ-419] N80-14913
DIALYSIS
Dialysis system — using ion exchange resin membranes permeable to urea molecules
[NASA-CASE-NPO-14101-1] N80-14687
DIATOMIC GASES
The generalized phase shift approach to rotational excitation in dilute diatomic gases
N80-14202
DIBORANE
Vibrational spectra of solid ethane; vibrational spectra of diborane in an argon matrix
N80-14203
DIESEL ENGINES
Measurement of fluid motion in a diesel engine cylinder by use of a tracer gas technique
N80-14399
DIFFERENTIAL THERMAL ANALYSIS
SPAR thermal analysis processors reference manual, system level 16. Volume 1: Program execution
[NASA-CR-159162] N80-14212
DIFFERENTIATION [BIOLOGY]
Microcytophotology of neurohypophysis of rats under experimental conditions
[NASA-TM-75947] N80-14671
DIFFUSION
Diffusion induced grain boundary migration
[COO-5002-2] N80-14948
Diffusional mass transport in polycrystals containing stationary or migrating grain boundaries
[COO-5002-1] N80-14949
DIFFUSION THEORY
Diffusion induced grain boundary migration
[COO-5002-2] N80-14948
DIGITAL COMMAND SYSTEMS
Application of discrete guidance and control theory
[AD-A074782] N80-14172
DIGITAL COMPUTERS
An observer system for sensor failure detection and isolation in digital flight control systems
N80-14023
Baseline software data system. Volume 1: System description
[AD-A073358] N80-14761
DIGITAL FILTERS
Filtering of synthetic radar data
N80-14076
Coefficient quantization effects on pole locations for state-model digital filters
N80-14337
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results
[ESA-CR(P)-1223-VOL-1] N80-14784
DIGITAL SIMULATION
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation
[NASA-TM-80136] N80-14163
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
The 10 MW solar thermal pilot plant dynamic simulation. Volume 1: Computer program description
[ATR-78(7747)-1-VOL-1] N80-14550
The 10 MW solar thermal pilot plant dynamic simulation. Volume 2: Computer program source listing
[ATR-78-(7747)-2-VOL-2] N80-14551
DIGITAL SYSTEMS
Redundancy management considerations for a control-configured fighter aircraft triplex digital fly-by-wire flight control system
N80-14026

Failure detection, isolation and indication in highly integrated digital guidance and control system
N80-14027
An assessment of and approach to the validation of digital flight control systems
N80-14036
Federated microcomputer systems for on-board missile guidance and control
N80-14040
Integration of flight and fire control — systems analysis of digital controlled integrated flight and fire control systems
N80-14043
Digital system for dynamic turbine engine blade displacement measurements
[NASA-TM-81382] N80-14113
DSN radio science system, Mark III-80
N80-14152
Techniques and benefits of shaping the pulses of binary sequences with application to spread spectrum radio communications
[AD-A073964] N80-14322
Linear modulation techniques for digital microwave
[AD-A074047] N80-14323
DIGITAL TECHNIQUES
Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017
State of the art for digital avionics and controls, 1978
N80-14018
A flight control system using the DAIS architecture
N80-14019
Trends in digital data processing and system architecture — avionics applications
N80-14020
A method for designing multiprocessor architectures for avionics functions
N80-14021
Recent advances in fibre optics for high integrity digital control systems
N80-14025
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission
N80-14030
Digital array signal processing techniques applied to guidance and navigation
N80-14032
Digital signal processing techniques in a monopulse tracking radar
N80-14035
The microprocessor-based synthesizer controller
N80-14162
SCANLINE: A computer program for converting raster maps into line maps
[CSIR-TWISK-43] N80-14426
On the use of digital photogrammetric measurements in the compilation of topographic maps
[SER-1-ORIGINAL-REPT-76] N80-14462
Digital wavefront reconstruction for acoustical applications
[AD-A073775] N80-14845
DIRECT CURRENT
Wave propagation in a dc superconducting cable. Part 1: Analysis
[LA-UR-79-226] N80-14346
DIRECTIONAL SOLIDIFICATION [CRYSTALS]
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4693] N80-14200
DIRECTIVITY
Directivity of acoustic radiation from sources
N80-14863
DIRICHLET PROBLEM
Modular programs for the fast solving of linear elliptic equations by reduction methods: TR2D01, TR2D02 to solve the Dirichlet problem for Helmholtz equation; user's manual concerning the club MODULEF
[GMD-MITT-47] N80-14781
DISCRIMINATION
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS]
N80-14097
DISPLAY DEVICES
Visual displays for air traffic control data
N80-14077
Effect of peripherally presented visual signals on pilot performance during flight simulation
[AD-A073604] N80-14703
Spatial data management system
[AD-A068863] N80-14964
DISSOCIATION
Dissociation pressure measurements on salts proposed for thermochemical energy storage
[SAND-79-8033] N80-14532
Molecular reaction rates
[AD-A073851] N80-14882
DISTANCE MEASURING EQUIPMENT
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[RAE-TR-2021] N80-14376
DISTRIBUTION [PROPERTY]
Two FORTRAN programs for the computation of the mean beam pattern of a perturbed array
N80-14780
DISULFIDES
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
DOMESTIC ENERGY
Dynamic energy system optimization model — study of computerized simulation domestic energy models
[EPRI-EA-1079] N80-14514
New hybrid 1971 energy intensities, part 1 — computation of domestic energy consumption versus economic factors
[COO-4628-4-PT-1] N80-14516
DOPED CRYSTALS
The role of phosphorus in the intergranular embrittlement of Fe-3Si
N80-14230
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining steels
N80-14231
DOPPLER RADAR
Target tracking using Doppler-information in sensor oriented coordinates with a three dimensional array radar
[REPT-270] N80-14325
DOUBLE BASE ROCKET PROPELLANTS
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A074963] N80-14262
DRAFTING MACHINES
Cartographic automation status in a German hydrographic institute
N80-14433
DRONE AIRCRAFT
Propulsion options for the HI SPOT long endurance drone airship
[AD-A074595] N80-14132
DUCTED FAN ENGINES
The analysis of sound propagation in jet engine ducts using the finite difference method
[AD-A074233] N80-14853
DUST
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation
[AD-A073859] N80-14388
DWELL
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
DYE LASERS
Forward and backward stimulated Raman scattering in a multimode fiber
[CONF-780681-2] N80-14394
DYES
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392
DYNAMIC CHARACTERISTICS
Phase-locking in power oscillators
N80-14085
Measuring methods of repeater characteristics for circular waveguide systems
N80-14301
DYNAMIC MODELS
Stochastic modeling of the time-averaged equations for climate dynamics
[NASA-CR-162527] N80-14652
DYNAMIC RESPONSE
Linear systems analysis program, L224[QR]. Volume 1: Engineering and usage
[NASA-CR-2861] N80-14137
Unsteady flow and dynamic response analyses for helicopter rotor blades
[NASA-CR-159190] N80-14355
Off-center, low velocity, transverse normal impact of a simply supported plate
[AD-A074946] N80-14416
Triaxial measurement of stress waves in the free-field
[SAND-78-2123C] N80-14420
DYNAMIC STABILITY
Performance evaluation of a coherent chain in transmission
N80-14083
The influence of transmitter stability on primary radar performance
N80-14084
DYNAMIC STRUCTURAL ANALYSIS
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932

E

E-3A AIRCRAFT
Ground-based propagation measurements in support of flight evaluation of the E-3A OMEGA navigation system, June - November 1976
[AD-A074474] N80-14321
EARTH ATMOSPHERE
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres
[PR-462] N80-15017
EARTH MANTLE
The implication of Pn amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14606
EARTH OBSERVATIONS [FROM SPACE]
On-board multispectral classification study
[NASA-CR-3134] N80-14760
EARTH SURFACE
Physical background of remote sensing — multispectral reconnaissance of the Earth surface
N80-14443
EARTHQUAKES
Seismic discrimination — between earthquakes and underground nuclear explosions
[AD-A073772] N80-14614
United States earthquakes, 1977
[PB-300863/8] N80-14624
ECHO SOUNDING
Atmospheric echo sounding. A bibliography with abstracts
[NTIS/PS-0989/8] N80-14626
ECLIPSES
ATS-5 and ATS-6 potentials during eclipse
[AD-A074878] N80-14170
ECOLOGY
Environment and the quality of life
[EUR-5970] N80-14582
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-B: Compendium of work element reports
[PB-299687/4] N80-14589
ECONOMIC ANALYSIS
Computer program for assessing the economic feasibility of solar energy for single family residences and light commercial applications
[NASA-TM-78251] N80-14501
Geothermal energy market study on the Atlantic coastal plain. Economic evaluation model for direct use of moderate temperature, up to 250 F, geothermal resources in the northern Atlantic coastal plain
[PB-298785/7] N80-14578
ECONOMIC DEVELOPMENT
Distribution and classification of local socio-economic impacts from energy development
[CONF-790481-1] N80-14954
ECONOMIC FACTORS
New hybrid 1971 energy intensities, part 1 — computation of domestic energy consumption versus economic factors
[COO-4628-4-PT-1] N80-14516
A review of the economics of selected passive and hybrid systems — design concepts for solar energy utilization
[SERI/TP-61-144] N80-14547
ECONOMIC IMPACT
Distribution and classification of local socio-economic impacts from energy development
[CONF-790481-1] N80-14954
EDDY CURRENTS
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[RAE-TR-2021] N80-14376
EDITING ROUTINES [COMPUTERS]
An interactive editor for cartographic data
N80-14431
EDUCATION
The European approach to the selection and training of SL payload specialists
N80-14681
EFFERENT NERVOUS SYSTEMS
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization
[NASA-TM-75983] N80-14672
ELASTIC DEFORMATION
Stretching the circular cylindrical elastic sheet
N80-14800
ELASTIC SHEETS
Stretching the circular cylindrical elastic sheet
N80-14800
ELASTIC WAVES
Photoacoustic stress
[UCRL-82594] N80-14419
ELASTOMERS
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-162542] N80-14486
ELECTRIC CORONA
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14301
ELECTRIC CURRENT
Bi-directional four quadrant [BDQ4] power converter development
[NASA-CR-159660] N80-14480
ELECTRIC DIPOLES
Coefficient quantization effects on pole locations for state-model digital filters
N80-14337

ELECTRIC FIELDS
Determination of the velocity-field characteristic of gallium arsenide from Franz-Keldysh electroabsorption
N80-14331
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
ELECTRIC GENERATORS
High strength austenitic alloys for generator retaining rings
[EPRI-FP-1061] N80-14239
Bi-directional four quadrant [BDQ4] power converter development
[NASA-CR-159680] N80-14480
Commercialization strategy report for hydrothermal electric and direct heat application — project phasing of geothermal resources for geothermal energy conversion for heating electricity generation
[TID-28894-DRAFT] N80-14508
Preliminary design of axial flow hydrocarbon turbine/generator set for geothermal applications
[EPRI-ER-513] N80-14536
ELECTRIC HYBRID VEHICLES
Electric and hybrid vehicles: Commercialization phase 3 planning
[DOE/ERD-0004] N80-14349
Commercialization strategy report for electric and hybrid vehicles
[TID-28858-DRAFT] N80-14972
ELECTRIC MOTOR VEHICLES
Advanced batteries for electric vehicles: A look at the future
[CONF-790404-1] N80-14531
Review of industrial participation on the ANL lithium/iron sulfide battery development program — for energy storage and electric vehicles
[CONF-780852-1] N80-14573
Commercialization strategy report for electric and hybrid vehicles
[TID-28858-DRAFT] N80-14972
Assessment of the applicability of mechanical energy storage devices to electric and hybrid vehicles. Volume 1: Executive summary
[UCRL-52773-VOL-1] N80-14973
ELECTRIC MOTORS
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part B
[NASA-CR-160355] N80-14339
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 2: User's guide to computer EMA model
[NASA-CR-160356] N80-14340
Power factor controller
[NASA-TM-80755] N80-14479
ELECTRIC POWER PLANTS
solar thermal power systems advanced solar thermal technology project, advanced subsystems development
[NASA-CR-162546] N80-14491
Simulation approach for base-line energy-siting analysis
[CONF-790459-22] N80-14511
Solid electrolyte fuel cell for electric power generation — nonaqueous electrolyte fuel cells development for electric power plants
[BNL-26274] N80-14522
Compressed air energy storage technology program — concept for supplying electric power to meet peak load demands
[PNL-2935] N80-14534
Superconducting magnetic energy storage for electric power system dynamic stabilization
[LA-UR-79-1220] N80-14535
The 10 MW solar thermal pilot plant dynamic simulation. Volume 1: Computer program description
[ATR-78(7747)-1-VOL-1] N80-14550
The 10 MW solar thermal pilot plant dynamic simulation. Volume 2: Computer program source listing
[ATR-78-(7747)-2-VOL-2] N80-14551
Systems Studies for Central Solar Thermal Electric
[CONF-780301] N80-14558
Electric utility solar energy activities, 1978
[EPRI-ER-966-SR] N80-14560
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion — models for environmentally clean power plant design
[COO-4272-3] N80-14587
Accuracy of remotely sensed SO2 mass emission rates
[PB-298077/9] N80-14594
ELECTRIC POWER SUPPLIES
Operating-manual for the Dynamic Test Set [DTS] for the low voltage power supply part of the AN/ALQ-119 V electronic countermeasures system
[AD-A074894] N80-14345
ELECTRIC POWER TRANSMISSION
Energy analysis of the basic materials utilized in electric power transmission systems
[HCP/T5043-01] N80-14510
ELECTRIC SPARKS
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206
ELECTRICAL IMPEDANCE
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[BAE-TR-3021] N80-14376
ELECTRICAL INSULATION
The use of chelates to neutralize defects giving rise to partial discharges in insulating materials other than polyethylene: The particular case of epoxy resins
[PUBL-379] N80-14255
ELECTRICAL MEASUREMENT
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry
[AD-A074806] N80-14216
ELECTRICAL PROPERTIES
Effect of silver on the structure and properties of arsenic-trisulfide glass
N80-14247
Electrical compensation in InP produced by background impurities and structural defects
[AD-A074178] N80-14945
ELECTRICAL RESISTIVITY
Conductive polymers consisting of partially oxidized, face-to-face linked metallomacrocycles
[AD-A074538] N80-14251
ELECTRO-OPTICS
Non-contacting electro-optical contouring of helicopter rotor blades
[AD-A070896] N80-14111
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728] N80-14227
Optoelectronic properties of metal-tunnel oxide-silicon junctions
N80-14336
A study on selected wideband guided-wave acousto-optic and electro-optic devices
N80-14899
Ultra-rapid electro-optical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11458] N80-14908
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909
ELECTROCHEMICAL MACHINING
Apparatus for electrolytically tapered or contoured cavities
[NASA-CASE-XNP-08835-1] N80-14395
ELECTROCHEMISTRY
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
Solid electrolyte fuel cell for electric power generation — nonaqueous electrolyte fuel cells development for electric power plants
[BNL-26230] N80-14522
ELECTRODEPOSITION
Improved refractory coatings and method of producing the same
[NASA-CASE-LEW-13160-1] N80-14232
ELECTRODES
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206
Preliminary study of some graphite electrode surfaces responsive to iron and heavy metals by single-sweep voltammetry
[AD-A074605] N80-14343
Apparatus for electrolytically tapered or contoured cavities
[NASA-CASE-XNP-08835-1] N80-14395
ELECTRODYNAMICS
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-598] N80-14790
ELECTROLUMINESCENCE
Procedure for the formation of a coating on an object by polymerization by luminescent discharge
[NASA-TM-75926] N80-14348
ELECTROLYSIS
The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis
[AD-A073421] N80-14942
ELECTROLYTIC CELLS
Lithium inorganic electrolyte battery development
[AD-A073858] N80-14505
ELECTROMAGNETIC ABSORPTION
Measurement of the radiative properties of air at high temperatures and pressures
[AD-A074825] N80-14218
Electromagnetic power absorber
[NASA-CASE-NPO-13830-1] N80-14231
Study of two-photon absorption and amplification processes in gases
[AD-A074951] N80-14391
ELECTROMAGNETIC FIELDS
Classical theory of radiative transitions
N80-14285
Solution of electromagnetic boundary value problems of complicated structures. Theory of the integral equation method
[ESA-TT-596] N80-14820
ELECTROMAGNETIC INTERFERENCE
Performance evaluation methods of a secondary radar network
N80-14068
Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Local oscillator radiation from television receivers
[BBC-RD-1979/21] N80-14287
ELECTROMAGNETIC NOISE
Discrete time detection of signals in dependent non-Gaussian noise
N80-14283
ELECTROMAGNETIC RADIATION
VLF/LF reflectivity of the polar ionosphere, 3 September - 20 December 1978
[AD-A074475] N80-14317
Solution of electromagnetic boundary value problems of complicated structures. Theory of the integral equation method
[ESA-TT-596] N80-14820
ELECTROMAGNETIC WAVE TRANSMISSION
Propagation in circular waveguides
N80-14294
Problems and installation technique of the transmitting media of a circular waveguide link
N80-14298
Study of two-photon absorption and amplification processes in gases
[AD-A074951] N80-14391
ELECTROMECHANICAL DEVICES
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423
ELECTRON ATTACHMENT
High resolution threshold photoelectron spectroscopy by electron attachment
[NASA-CASE-NPO-14078-1] N80-14877
ELECTRON BEAMS
Dual beam dual mode TWT
[AD-A074719] N80-14344
ELECTRON CYCLOTRON HEATING
Ion heating by the current-driven turbulence in an inhomogeneous plasma
[IPPJ-423] N80-14911
ELECTRON DENSITY [CONCENTRATION]
The electron-phonon interaction spectrum in proximity effect copper
N80-14937
ELECTRON DIFFRACTION
An electron diffraction study of laser excited sulfur hexafluoride
N80-14207
ELECTRON DIFFUSION
Anomalous electron thermal conductivity across destroyed magnetic surfaces
[PR-501] N80-14929
ELECTRON ENERGY
Soft X-ray measurements for investigating plasma focus dynamics
[IPF-78-1] N80-14925
ELECTRON IMPACT
Molecular reaction rates
[AD-A073851] N80-14882
Scalable standard optical sources in the VUV: Emissions from electron impact on metals — tantalum and tungsten
[NASA-CR-162562] N80-14900
ELECTRON PARAMAGNETIC RESONANCE
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K
[AD-A074264] N80-14213
Electron spin echo spectroscopy and photosynthesis
[CONF-780741-4] N80-14228
ELECTRON PHONON INTERACTIONS
The electron-phonon interaction spectrum in proximity effect copper
N80-14937
ELECTRON SOURCES
Evaluation of the VA-876P klystron for the 20-kW X-band uplink transmitter
N80-14157
ELECTRON SPECTROSCOPY
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420] N80-14920
ELECTRON TRANSFER
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
ELECTRON TUNNELING
Optoelectronic properties of metal-tunnel oxide-silicon junctions
N80-14336
ELECTRONIC COUNTERMEASURES
Operating-manual for the Dynamic Test Set [DTS] for the low voltage power supply part of the AN/ALQ-119 V electronic countermeasures system
[AD-A074894] N80-14345

ELECTRONIC EQUIPMENT TESTS
Test specification for two-sided printed circuit boards (gold plated finish)
[ESA-PSS-05/QRM-10E-ESTEC-ISS-2] N80-14350
Development of a comparative analyzer for microprocessor
[BDX-613-2060-REV] N80-14765
ELECTROPHORESIS
Hydrodynamic and electrostatic characterization of particles by light scattering
N80-14209
Electrophoretic fractional elution apparatus employing a rotational seal fraction collector
[NASA-CASE-MFS-23284-1] N80-14397
ELECTROPHYSIOLOGY
Brain waves and the enhancement of pilot performance
N80-14751
ELECTROSTATIC CHARGE
Hydrodynamic and electrostatic characterization of particles by light scattering
N80-14209
Fugitive and fine particle control using electrostatically charged fog
[PB-298060/9] N80-14593
ELEMENTARY PARTICLE INTERACTIONS
Capture of muons in atoms
[CALT-63-304] N80-14888
Pion nucleon interaction at low energy
[ORO-5126-60] N80-14895
ELLIPTICAL POLARIZATION
Preliminary study on the utilization of adaptive radar receivers with diversity polarization
N80-14081
ELUTION
Electrophoretic fractional elution apparatus employing a rotational seal fraction collector
[NASA-CASE-MFS-23284-1] N80-14397
EMBRITTLEMENT
The role of phosphorus in the intergranular embrittlement of Fe-3Si
N80-14230
EMISSION SPECTRA
X-ray variability observed with HEAO A-1
N80-14978
The scientific results of the low energy portion of A-2
N80-14980
High energy X-ray results from HEAO-1: X-ray pulsars, and the all sky survey
N80-14984
EMOTIONAL FACTORS
Some considerations concerning methods to evaluate and assess workload in aircraft pilots
N80-14743
ENERGY ABSORPTION FILMS
Studies of directly absorbing fluids for mid-temperature solar thermal applications
[MLM-2625-OP] N80-14540
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
ENERGY CONSERVATION
NASA broad-specification fuels combustion technology program: Status and description
[NASA-TM-79315] N80-14126
Power factor controller
[NASA-TM-80755] N80-14479
Highlights of the energy technology programs
[BNL-50959] N80-14512
Report to the Congress on the coordination of Federal energy conservation programs involving state and local governments
[DOE/TIC-10127] N80-14515
Energy conservation in the US economy from increased recycle of obsolete steel scrap
[COO-2893-10] N80-14524
Energy Policy and Conservation Act [Public Law 94-163] as amended by the National Energy Conservation Policy Act [Public Law 95-619]. Title 10: Energy. Chapter 2: Department of Energy. Subchapter D: Energy Conservation. Part 430: Energy conservation program for consumer products
[DOE/CS-0056] N80-14567
ENERGY CONSUMPTION
New hybrid 1971 energy intensities, part 1 — computation of domestic energy consumption versus economic factors
[COO-4628-4-PT-1] N80-14516
US energy flow in 1978
N80-14517
Interrelationships between man, energy, and water quality: A new methodology for integrative analyses
[BNL-26188] N80-14586
ENERGY CONVERSION
A cesium TELEC experiment at Lewis Research Center
[NASA-CR-159729] N80-14386
A probabilistic study of wind-electric conversion systems from the point of view of reliability and capacity credit
N80-14475
Analysis and simulation of wind energy systems
[NASA-CR-162538] N80-14487
Highlights of the energy technology programs
[BNL-50959] N80-14512
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-8431] N80-14533
Engineers guide to solar energy
[PB-297043/2] N80-14574
Environmental options for coal use
[LA-UR-79-1393] N80-14584
ENERGY CONVERSION EFFICIENCY
Self-reconfiguring solar cell system
[NASA-CASE-LEW-12586-1] N80-14472
Photovoltaic energy conversion in polymer films
N80-14477
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
ENERGY DISTRIBUTION
Acoustic Energy
N80-14866
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909
The ionization and neutralization of sputtered atoms — study of surface ionization and dependence of sputtered atoms on energy distribution
N80-14939
ENERGY LEVELS
High resolution threshold photoelectron spectroscopy by electron attachment
[NASA-CASE-NPO-14078-1] N80-14877
ENERGY POLICY
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
High-BTU coal gasification processes
[ANL/CES/TE-79-2] N80-14263
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264
The solar in Federal buildings demonstration program
[PB-298535/6] N80-14279
Energy from the West: Energy resource development systems report. Volume 1: Introduction and general social controls
[PB-299177/6] N80-14463
Energy from the West: Energy resource development systems report. Volume 2: Coal
[PB-299178/4] N80-14464
Energy from the West: Energy resource development systems report. Volume 3: Oil shale
[PB-299179/2] N80-14465
Energy from the West: Energy resource development systems report. Volume 4: Uranium
[PB-299180/0] N80-14466
Energy from the West: Energy resource development systems report. Volume 5: Oil and natural gas
[PB-299181/8] N80-14467
Energy from the West: Energy resource development systems report. Volume 6: Geothermal
[PB-299182/6] N80-14468
Residential photovoltaic module and array requirements study, appendices
[NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study
[NASA-CR-162528] N80-14482
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162544] N80-14484
Application of field-modulated generator systems to dispersed solar thermal electric generation
[NASA-CR-162536] N80-14488
Results of thermal performance evaluation of the Owens-Illinois sunpack liquid solar collector at indoor conditions
[NASA-CR-161189] N80-14500
Outlook for nuclear fusion energy
[CONF-7811126-1] N80-14509
Simulation approach for base-line energy-siting analysis
[CONF-790459-22] N80-14511
Highlights of the energy technology programs
[BNL-50959] N80-14512
Dynamic energy system optimization model — study of computerized simulation domestic energy models
[EPRI-EA-1079] N80-14514
Report to the Congress on the coordination of Federal energy conservation programs involving state and local governments
[DOE/TIC-10127] N80-14515
New hybrid 1971 energy intensities, part 1 — computation of domestic energy consumption versus economic factors
[COO-4628-4-PT-1] N80-14516
Application of diffusion research to solar energy policy issues
[SERI/TR-51-194] N80-14518
Implementation of state solar incentives: Land-use planning to ensure solar access
[SERI/TR-51-163] N80-14519
Implementation of state solar incentives: A preliminary assessment
[SERI/TR-51-159] N80-14520
Energy conservation in the US economy from increased recycle of obsolete steel scrap
[COO-2893-10] N80-14524
Definition and analysis of the barriers to the implementation of urban energy recovery systems
[ANL/CNEV/TM-2] N80-14525
Non-tracking inflated cylindrical solar concentrator
[UCRL-82721] N80-14528
Commercial solar augmented heat pump system
[EPRI-ER-1004] N80-14537
Construction and initial operation of the Miamisburg salt-gradient solar pond
[MLM-2636-OP] N80-14541
Geothermal energy: Program summary
[DOE/ET-0101] N80-14542
Fifth Ocean Thermal Energy Conversion Conference, volume 2, sections 4-5
[CONF-780236-P2] N80-14553
Systems Studies for Central Solar Thermal Electric
[CONF-780363] N80-14558
Electric utility solar energy activities, 1978
[EPRI-ER-966-SR] N80-14560
Photovoltaic incentives options
[HCP/CS-0023] N80-14561
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790373-1] N80-14562
Energy Policy and Conservation Act [Public Law 94-163] as amended by the National Energy Conservation Policy Act [Public Law 95-619]. Title 10: Energy. Chapter 2: Department of Energy. Subchapter D: Energy Conservation. Part 430: Energy conservation program for consumer products
[DOE/CS-0056] N80-14567
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Realistic sizing of residential solar heating and cooling systems
[COO-2858-14] N80-14569
Evaluation of fuel resources and requirements for the magnetic fusion energy program
[MLM-2419] N80-14570
Proceedings of the DOE chemical/hydrogen energy contractor review systems
[CONF-771131] N80-14572
Commercializing solar heating: A national strategy needed
[PB-297882/3] N80-14575
Insolation models, data and algorithms
[SERI/TR-36-110] N80-14617
Assessment of the applicability of the national fire weather data library to wind energy analyses
[PNL-2538] N80-14685
Distribution and classification of local socio-economic impacts from energy development
[CONF-790481-1] N80-14954
ENERGY STORAGE
Photosensitization mechanisms for energy storing isomerizations
[AD-A074968] N80-14502
Energy storing organic photoreactions
[AD-A074915] N80-14503
Analysis of remote site energy storage and generation systems — systems analysis of solar energy conversion and windpower utilization energy storage systems
[AD-A074869] N80-14504
Lithium/metal sulfide battery development
[CONF-790538-10] N80-14530
Dissociation pressure measurements on salts proposed for thermochemical energy storage
[SAND-79-8033] N80-14532
Compressed air energy storage technology program — concept for supplying electric power to meet peak load demands
[PNL-2935] N80-14534
Superconducting magnetic energy storage for electric power system dynamic stabilization
[LA-UR-79-1220] N80-14535
Proceedings of the DOE chemical/hydrogen energy contractor review systems
[CONF-771131] N80-14572
Review of industrial participation on the ANL lithium/iron sulfide battery development program — for energy storage and electric vehicles
[CONF-780832-1] N80-14573
Assessment of the applicability of mechanical energy storage devices to electric and hybrid vehicles. Volume 1: Executive summary
[UCRL-52773-VOL-1] N80-14973
ENERGY TECHNOLOGY
Development of the steam-iron process for hydrogen production, 9010
[PE-2435-32] N80-14238
The solar in Federal buildings demonstration program
[PB-298535/6] N80-14279
Electric and hybrid vehicles: Commercialization phase 3 planning
[DOE/ERD-0004] N80-14349
Energy from the West: Energy resource development systems report. Volume 1: Introduction and general social controls
[PB-299177/6] N80-14463

Energy from the West: Energy resource development systems report. Volume 2: Coal
[PB-299178/4] N80-14464
Energy from the West: Energy resource development systems report. Volume 3: Oil shale
[PB-299179/2] N80-14465
Energy from the West: Energy resource development systems report. Volume 4: Uranium
[PB-299180/0] N80-14466
Energy from the West: Energy resource development systems report. Volume 6: Geothermal
[PB-299182/6] N80-14468
Solar concentrator
[NASA-CASE-MFS-23727-1] N80-14473
Method for forming a solar array strip
[NASA-CASE-NPO-13652-1] N80-14474
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162544] N80-14484
Analysis and simulation of wind energy systems
[NASA-CR-162538] N80-14487
Application of field-modulated generator systems to dispersed solar thermal electric generation
[NASA-CR-162536] N80-14488
solar thermal power systems advanced solar thermal technology project, advanced subsystems development
[NASA-CR-162566] N80-14491
Status of the DOE/NASA critical gas turbine research and technology project
[NASA-TM-79307] N80-14493
Development and testing of the Junkosper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78264] N80-14495
Highlights of the energy technology programs
[BNL-50959] N80-14512
Application of diffusion research to solar energy policy issues
[SERI/TR-51-196] N80-14518
Commercialization strategy report for energy from urban wastes
[TID-28852-DRAFT] N80-14521
Fuel cell option
[CONF-780937-1] N80-14523
Lawrence Livermore Laboratory geothermal energy program: A status report on the development of the Total-Flow concept
[UCRL-50046-77] N80-14529
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-8431] N80-14533
Commercialization strategy report for small wind systems
[TID-28844-DRAFT] N80-14543
Commercialization strategy report for large wind systems
[TID-28843-DRAFT] N80-14544
Commercialization strategy report for solar water heating
[TID-28856-DRAFT] N80-14545
Thermal energy storage for solar applications: An overview
[SERI/TP-34-099] N80-14546
A review of the economics of selected passive and hybrid systems — design concepts for solar energy utilization
[SERI/TP-61-144] N80-14547
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
Fifth Ocean Thermal Energy Conversion Conference, volume 2, sections 4-5
[CONF-780256-P2] N80-14553
Systems Studies for Central Solar Thermal Electric
[CONF-780803] N80-14558
Photovoltaic power systems market identification and analysis
[JSCP/T4022-01] N80-14559
Electric utility solar energy activities, 1978
[EPRI-ER-966-SR] N80-14560
System tests and applications photovoltaic program
[JSCP/T4024-01/15] N80-14566
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Process design and economic analysis of the zinc selenide thermochemical hydrogen cycle
[UCRL-52546] N80-14571
Proceedings of the DOE chemical/hydrogen energy contractor review systems
[CONF-771131] N80-14572
Engineers guide to solar energy
[PB-297043/2] N80-14574
Wave power systems
[PB-299931/6] N80-14576
West Coast Forum on Appropriate Technology — research in energy and environmental areas
[PB-298986/1] N80-14962

ENERGY TRANSFER

Polar ionosphere
N80-14611
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation
[IPPJ-32] N80-14917

ENGINE DESIGN

Quiet, Clean, Short-Haul, Experimental Engine [QCSEE] Under-The-Wing [UTW] engine acoustic design
[NASA-CR-135267] N80-14117
Quiet, Clean, Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] engine acoustic design
[NASA-CR-135268] N80-14118
Quiet Clean Short-Haul Experimental Engine [QCSEE] Under-The-Wing [UTW] graphite/PMR core development
[NASA-CR-135279] N80-14119
NASA broad-specification fuels combustion technology program: Status and description
[NASA-TM-79315] N80-14126
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part B
[NASA-CR-160355] N80-14139
Lawrence Livermore Laboratory geothermal energy program: A status report on the development of the Total-Flow concept
[UCRL-50046-77] N80-14529
Darrieus wind turbine program at Sandia Laboratories
[SAND-79-0997C] N80-14538

ENGINE NOISE

Quiet, Clean, Short-Haul, Experimental Engine [QCSEE] Under-The-Wing [UTW] engine acoustic design
[NASA-CR-135267] N80-14117
Quiet, Clean, Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] engine acoustic design
[NASA-CR-135268] N80-14118
Investigation of noise hazards in the engine test cell, CFB Baden-Soellingen
[AD-A074391] N80-14147
Applications of diffraction theory to aeroacoustics — aircraft noise
N80-14870

ENGINE TESTS

Modification of axial compressor streamline program for analysis of engine test data
[NASA-TM-79312] N80-14651
Quiet Clean Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] propulsion system test report. Volume 2: Aerodynamics and performance — engine performance tests to define propulsion system performance on turbofan engines
[NASA-CR-135324] N80-14120
Investigation of noise hazards in the engine test cell, CFB Baden-Soellingen
[AD-A074391] N80-14147
The 0.1 wavenumber spectral measurements in the region from 2050 - 2410 wavenumbers of a static, experimental rocket motor at three pressure altitudes
[AD-A073704] N80-14191
An analysis of external burning propulsion
[AD-A074639] N80-14192
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part B
[NASA-CR-160355] N80-14339

ENGINEERING MANAGEMENT

Functional design specification: NASA form 1510
[NASA-CR-162513] N80-14955

ENTHALPY

Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074635] N80-14146

ENVIRONMENT EFFECTS

Liquefied gaseous fuels safety and environmental control assessment program
[DOE/EV-0036] N80-14266
Energy from the West: Energy resource development systems report. Volume 3: Oil shale
[PB-299179/2] N80-14465
Energy from the West: Energy resource development systems report. Volume 4: Uranium
[PB-299180/0] N80-14466
Energy from the West: Energy resource development systems report. Volume 5: Oil and natural gas
[PB-299181/8] N80-14467
Surface water quality parameters for monitoring oil shale development
[PB-297984/7] N80-14470
Simulation approach for base-line energy-siting analysis
[CONF-790459-22] N80-14511
Hazardous properties and environmental effects of materials used in Solar Heating and Cooling [SHAC] technologies: Interim handbook
[DOE/EV-0028] N80-14565
Environmental options for coal use
[LA-UR-79-1393] N80-14584
Interrelationships between man, energy, and water quality: A new methodology for integrative analyses
[BNL-26198] N80-14586
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977-1978. Volume 2-A: Compendium of work element reports
[PB-299681/6] N80-14588
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977-1978. Volume 2-B: Compendium of work element reports
[PB-299687/4] N80-14589
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-299473/0] N80-14595
Environmental assessment of construction grants projects — environmental impact
[PB-299209/7] N80-14597

ENVIRONMENT MANAGEMENT

Energy from the West: Energy resource development systems report. Volume 1: Introduction and general social controls
[PB-299177/6] N80-14463
West Coast Forum on Appropriate Technology — research in energy and environmental areas
[PB-298986/1] N80-14962

ENVIRONMENT MODELS

Crop weather models: Concepts and applications
N80-14450

ENVIRONMENT POLLUTION

Environment and the quality of life
[EUR-5970] N80-14582
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern
[AD-A074829] N80-14583

ENVIRONMENT PROTECTION

Electric and hybrid vehicles: Commercialization phase 3 planning
[DOE/ERD-0064] N80-14349

ENVIRONMENT SIMULATION

Reactor for simulation and acceleration of solar ultraviolet damage
[NASA-CR-162533] N80-14405

ENVIRONMENTAL MONITORING

Crop environment monitoring: The remote sensing systems
N80-14452
Crop environment monitoring: The assessment of environmental phenomena using satellite remote sensing data
N80-14454
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603
Arctic Research in Environmental Acoustics [AREA]. Technical report no. 8: Arctic lead-airdrop data buoy
[AD-A074731] N80-14664

ENVIRONMENTAL SURVEYS

Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-299473/0] N80-14595
Environmental assessment of construction grants projects — environmental impact
[PB-299209/7] N80-14597

ENVIRONMENTAL TESTS

Methodology investigation exposure/performance test of selected material items — Army equipment in Panama Canal zone
[AD-A074001] N80-14406
Environmental testing of block 3 solar cell modules. Part 1: Qualification testing of standard production modules
[NASA-CR-162547] N80-14489
Microbial colonization of materials at Innisfail, Queensland
[MRL-TN-428] N80-14670

ENZYME ACTIVITY

Therapy on nerve agent poisoning
N80-14732

EPITAXY

The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis
[AD-A073421] N80-14942
Growth and characterization of epitaxial piezoelectric and semiconductor films
[AD-A073815] N80-14943
Electrical compensation in InP produced by background impurities and structural defects
[AD-A074175] N80-14945

EPOXY RESINS

The use of chelates to neutralize defects giving rise to partial discharges in insulating materials other than polyethylene: The particular case of epoxy resins
[PUBL-379] N80-14235

EQUALIZERS [CIRCUITS]

Adaptive equalization of delay distorted signals
[REPT-13-78] N80-14326

EQUATIONS OF MOTION

The generalized phase shift approach to rotational excitation in dilute diatomic gases
N80-14202
Models — for the stratosphere
N80-14643
Kinematic analysis of osmotic processes under non-equilibrium conditions
N80-14669
Acoustic equations in moving fluids
N80-14860
Propagation in ducts
N80-14864

Acoustic Energy
N80-14866

EQUATIONS OF STATE
Sound velocity and equation-of-state measurements in high pressure fluid and solid helium
[LA-UR-79-721]
N80-14856

EQUILIBRIUM EQUATIONS
Rigid-rotor equilibrium of intense relativistic electron beam
[AD-A073318]
N80-14892

EQUILIBRIUM FLOW
Rigid-rotor equilibrium of intense relativistic electron beam
[AD-A073318]
N80-14892

EQUIPMENT SPECIFICATIONS
Extrapolation techniques for the evaluation of digital communications equipment
N80-14282

S + S/X bands coherent transponder specification
[ESA-PSS-48[TTC.C.10]-ISSUE-1]
N80-14327

NBS interagency transducer project 1951 - 1979: An overview
[NBS-TN-1110]
N80-14373

Performance evaluation of the Horiba Instruments, Incorporated model U-7 water quality checker
[PB-299815/2]
N80-14382

Assessment of the applicability of mechanical energy storage devices to electric and hybrid vehicles. Volume 1: Executive summary
[UCRL-52773-VOL-1]
N80-14973

ERROR ANALYSIS
Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072

Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100

Determination of the repeatability of PEC — flight tests for position error calibrating
[AETE-FR-79/36]
N80-14109

Validation and error in multiplicative utility functions
[AD-A073362]
N80-14898

ERROR CORRECTING CODES
An efficient program for decoding the [255,223] Reed-Solomon code over GF [2 to the 8th power] with both errors and erasures, using transform decoding
N80-14161

ERROR DETECTION CODES
Failure detection, isolation and indication in highly integrated digital guidance and control system
N80-14027

Error control systems for multi-access communication channels
[AD-A074569]
N80-14314

ERRORS
FEI camera system, acceptance test and checkout procedure, as installed in BQM-34 A/S and BQM-34 E/T
[AD-A074388]
N80-14378

ERYTHROCYTES
A controlled rate freeze/thaw system for cryopreservation of biological materials
[NASA-CR-162531]
N80-14675

The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants
N80-14686

ESA SATELLITES
S + S/X bands coherent transponder specification
[ESA-PSS-48[TTC.C.10]-ISSUE-1]
N80-14327

ESCAPE SYSTEMS
Aeronautical systems technology needs: Escape, rescue and survival
[AD-A074906]
N80-14061

ESTIMATING
The range reduction of primary radar due to rain
N80-14082

ETHANE
Vibrational spectra of solid ethane; vibrational spectra of diborane in an argon matrix
N80-14303

ETHYL ALCOHOL
Fusarium species: Their potential for transforming biomass to ethanol
[ANL/EES-TM-38]
N80-14271

ETHYL COMPOUNDS
Carborane synthesis — thermolysis of tetraethyl ammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570]
N80-14217

EUROPEAN SPACE AGENCY
The ESA remote sensing program: Present activities and future plans
N80-14449

EUROPEAN SPACE PROGRAMS
The ESA remote sensing program: Present activities and future plans
N80-14449

Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
[ESA-SP-01]
N80-14677

EVALUATION
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14101

EVAPORATION RATE
The application of thermal infrared remote sensing data to soil moisture and evaporation determination
N80-14447

EVASIVE ACTIONS
Two-target pursuit-evasion differential games in the plane — liapunov techniques
[CSIR-TWISK-74]
N80-14830

EXHAUST DIFFUSERS
Effect of velocity overshoot on the performance of magnetohydrodynamic subsonic diffusers
[NASA-TM-79105]
N80-14922

EXHAUST EMISSION
Exhaust emission reduction for intermittent combustion aircraft engines
[NASA-CR-159757]
N80-14130

Accuracy of remotely sensed SO2 mass emission rates
[PB-298077/9]
N80-14594

Aerometric data analysis for the Houston Area Oxidant Study, volume 2
[PB-299648/6]
N80-14599

Aerometric data analysis for the Houston Area Oxidant Study. Volume 1: Executive summary
[PB-299647/8]
N80-14600

Ambient temperature, fuel economy, emissions, and trip length
[PB-298047/5]
N80-14976

EXHAUST GASES
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines
[NASA-TP-1582]
N80-14125

EXHAUST NOZZLES
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532]
N80-14124

EXHAUST SYSTEMS
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556]
N80-14121

EXOBIOLOGY
Recent advances in Aeronautical and Space Medicine
[AGARD-CP-265]
N80-14678

Simulation of physiological systems in order to evaluate and predict the human condition in a space flight
[NASA-TM-76016]
N80-14716

Biological systems for human life support: Review of the research in the USSR
[NASA-TM-76018]
N80-14717

EXPANDABLE STRUCTURES
Antenna deployment mechanism for use with a spacecraft — extensible and retractable telescopic antenna mast
[NASA-CASE-GSC-12331-1]
N80-14183

EXPERIMENTAL DESIGN
Experimental campaign for the analysis of dynamic clutter: Processing of recorded data
N80-14079

Galileo probe thermal protection: Entry heating environments and spallation experiments design
[NASA-CR-152334]
N80-14184

An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique — experiment planning
[MPI-PAE/EXTRATERREST-152]
N80-14621

The design of meteorological field experiments with applications to the mesoscale — sensor placement for severe storm sampling
N80-14629

EXPLOSIVE DEVICES
Hosts and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211]
N80-14267

EXPLOSIVES
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A074963]
N80-14262

EXPOSURE
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL]
N80-14728

The effects of acute and chronic low dose exposure to anticholinesterases
N80-14729

The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment
N80-14731

EXTINCTION
Relationships between ir extinction, absorption and liquid water content of fogs
[AD-A074395]
N80-14653

EXTRAGALACTIC RADIO SOURCES
HEAO A-2 extragalactic results
N80-14981

A-3 scientific results - extragalactic
N80-14983

EXTRAPOLATION
Extrapolation techniques for the evaluation of digital communications equipment
N80-14282

EXTRATERRESTRIAL RADIATION
Correlated ground based observations in support of the HEAO-1 X-ray observatory
N80-14988

EXTRAVEHICULAR ACTIVITY
Regenerative CO2 removal for PLSS application
[NASA-CR-160439]
N80-14718

F

F REGION
Unsolved problems of the upper atmosphere
N80-14630

F-16 AIRCRAFT
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability — F-16
[NASA-TP-1538]
N80-14136

F-100 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 129: F-100 aircraft in the AF32A-16 noise suppressor, near and far-field noise
[AD-A073793]
N80-14949

F-101 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 137: F-101B aircraft, near and far-field noise
[AD-A073617]
N80-14850

F-102 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 139: F-102A aircraft, near and far-field noise
[AD-A073618]
N80-14851

F-106 AIRCRAFT
Stability and control aspects of the CCV-F106G
[MDB-UFE-1447[O]]
N80-14141

F-105 AIRCRAFT
USAF bioenvironmental noise data handbook. Volume 125: F-105D aircraft, near and far-field noise
[AD-A073616]
N80-14848

FABRICATION
Method for forming a solar array strip
[NASA-CASE-NPO-13652-3]
N80-14474

FABRY-PEROT INTERFEROMETERS
Imaging in a Fabry-Perot interferometer
N80-14098

FAIL-SAFE SYSTEMS
Failure detection, isolation and indication in highly integrated digital guidance and control system
N80-14027

A redundant inertial navigation system for IUS
N80-14029

FAILURE
Automatic recovery after sensor failure onboard
N80-14024

FAILURE MODES
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2]
N80-14240

FAR FIELDS
Experimental measurements of moving noise sources
N80-14868

FAR ULTRAVIOLET RADIATION
Scalable standard optical sources in the VUV: Emissions from electron impact on metals — tantalum and tungsten
[NASA-CR-162562]
N80-14900

FARM CROPS
Overview of agrometeorology — influence of meteorological parameters on crop growth
N80-14441

The agro-ecological zones project — agroclimatic and land suitability assessment for various crops
N80-14445

FARMLANDS
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York
N80-14424

FAST FOURIER TRANSFORMATIONS
An efficient program for decoding the [255,223] Reed-Solomon code over GF [2 to the 8th power] with both errors and erasures, using transform decoding
N80-14161

FATIGUE [MATERIALS]
An X-ray study of the region around static and fatigue cracks
N80-14411

Review of investigations into aeronautics related fatigue Federal Republic of Germany
[LBF-S-142]
N80-14422

FATIGUE TESTS
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U]
N80-14413

FEASIBILITY ANALYSIS
Automatic systems for airport surface mobile media surveillance based on the use of secondary media
N80-14104

FEDERAL BUDGETS
Press conference: FY 1980 budget
[P79-10182]
N80-14968

The NASA FY 1980 budget
[PB-80183] N80-14969
FEED SYSTEMS
Supercharged topping rocket propellant feed system
[NASA-CASE-XLE-02865-1] N80-14188
FEEDBACK AMPLIFIERS
Energy-dependent losses in pulsed-feedback preamplifiers
[LBL-8135] N80-14348
FELDSPARS
Apollo 12 feldspathic basalts 12031, 12038, and 12072: petrology, comparison
[LA-UR-79-1117] N80-15014
FEMALES
A consideration of factors contributing to strength differences in men and women
[AD-A072671] N80-14694
FIBER COMPOSITES
Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79304] N80-14196
FIBER OPTICS
Recent advances in fibre optics for high integrity digital control systems
N80-14025
Thick film fiber optics to integrated optics interface
[EGG-1183-5104] N80-14907
FIELD THEORY [ALGEBRA]
Boolean valued models and Galois theory for commutative regular rings
N80-14832
FIELD THEORY [PHYSICS]
Statistical mechanics and field theory
[LBL-9164] N80-14952
FIGHTER AIRCRAFT
Redundancy management considerations for a control-configured fighter aircraft triplex digital fly-by-wire flight control system
N80-14026
High angle of attack characteristics of different fighter configurations
[MBB-UFE-1443(0)] N80-14058
Flight testing of the buffeting behavior of combat aircraft
[ESA-TT-523] N80-14143
An advanced oxygen system for future combat aircraft
N80-14680
FINITE DIFFERENCE THEORY
An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056
Comparison of regression, difference and ratio estimates in sample theory
[GMD-MITT-42] N80-14018
The analysis of sound propagation in jet engine ducts using the finite difference method
[AD-A074233] N80-14853
FINITE ELEMENT METHOD
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices
[AD-A073660] N80-14261
Viscous film flows with contact lines: Finite element simulation, a basis for stability assessment and design optimization
N80-14351
FINNED BODIES
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188] N80-14046
FIRE CONTROL
Integration of flight and fire control — systems analysis of digital controlled integrated flight and fire control systems
N80-14043
FIRE PREVENTION
A study of fire safety effectiveness statements — buildings
[PB-299160/3] N80-14275
Fire-code inspections and fire prevention: What methods lead to success
[PB-298991/1] N80-14276
FLAMMABILITY
Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256
FLAT PLATES
Visualization of natural convection in flat plate solar collectors
N80-14476
Thermal performance evaluation of the Suncatcher SH-11 [flat] solar collector
[NASA-CR-161253] N80-14497
FLEXIBLE BODIES
Surface conforming thermal/pressure seal — for control devices in space vehicles
[NASA-CASE-MSC-18422-1] N80-14400
FLIGHT CHARACTERISTICS
Investigation of the oscillatory and flight behavior of rotor systems in relation with atmospheric turbulence
[BMVG-FBWT-79-5] N80-14142
FLIGHT CLOTHING
Concerning individual equipment for fighter pilots in the Air Force
N80-14735
US aircrew chemical defense ensembles
N80-14736
FRG aircrew chemical defence ensembles
N80-14737
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738
FLIGHT CONDITIONS
Needed weather information where it belongs; in the cockpit
N80-14635
FLIGHT CONTROL
Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017
State of the art for digital avionics and controls, 1978
N80-14018
A flight control system using the DAIS architecture
N80-14019
An observer system for sensor failure detection and isolation in digital flight control systems
N80-14023
Automatic recovery after sensor failure onboard
N80-14024
Recent advances in fibre optics for high integrity digital control systems
N80-14025
Integration of flight and fire control — systems analysis of digital controlled integrated flight and fire control systems
N80-14043
FLIGHT CREWS
Sleep and body rhythm disturbance in long-range aviation. The problem and a search for relief
N80-14714
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
Aircrew workload assessment techniques — human factors engineering study of performance of flight crews workloads
N80-14746
Aircrew performance research opportunities using the Air Combat Maneuvering Range [ACMR]
N80-14753
Speech patterns and aircrew workload
N80-14754
FLIGHT FATIGUE
Survey of methods to assess workload
[AGARD-AG-246] N80-14739
Concepts of fatigue — survey of studies on pilot performance and flight fatigue discussed in terms of physiological and psychological stress
N80-14741
Concepts of stress
N80-14742
Physiologic aspects of workload/fatigue/stress
N80-14744
Some insights relative to the man-machine system: An overview of ten years of research
N80-14745
FLIGHT FITNESS
Recent advances in Aeromedical and Space Medicine
[AGARD-CP-265] N80-14678
Problems related to medical criteria for the selection of military navigation personnel
N80-14679
The European approach to the selection and training of SL payload specialists
N80-14681
FLIGHT OPERATIONS
Some considerations concerning methods to evaluate and assess workload in aircraft pilots
N80-14743
Workload assessment methodology development
N80-14747
FLIGHT PLANS
Flight Design System-1 System Design Document. Volume 9: Executive logic flow, program design language
[NASA-TM-80841] N80-14180
FLIGHT SAFETY
An evaluation of the bird/aircraft strike hazard at Barksdale Air Force Base, Louisiana [SAC]
[AD-A074390] N80-14063
Proceedings, Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems
[NASA-CP-2104] N80-14633
FLIGHT SIMULATION
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability — F-16
[NASA-TP-1538] N80-14136
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U] N80-14413
FLIGHT STABILITY TESTS
Stability and control aspects of the CCV-F10OG
[MBB-UFE-1447(0)] N80-14141
FLIGHT STRESS [BIOLOGY]
Supersonic aerial transport: Medical and physiological aspects — Concorde aircraft
N80-14683
Survey of methods to assess workload
[AGARD-AG-246] N80-14739
Concepts of stress
N80-14742
Some considerations concerning methods to evaluate and assess workload in aircraft pilots
N80-14743
Physiologic aspects of workload/fatigue/stress
N80-14744
FLIGHT TESTS
Determination of the repeatability of PEC — flight tests for position error calibrating
[AETE-FR-79/36] N80-14109
Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time
[NASA-TM-80194] N80-14114
Flight testing of the buffeting behavior of combat aircraft
[ESA-TT-523] N80-14143
FLIGHT TIME
Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time
[NASA-TM-80194] N80-14114
FLOOD DAMAGE
Satellite remote sensing in hazard monitoring and disaster evaluation
N80-14456
FLOW COEFFICIENTS
Ultrasonic density detector for vessel and reactor core two-phase measurements
[CONF-790646-5] N80-14361
FLOW DISTRIBUTION
Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14033
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133
Wall pressure fluctuations generated by a pair of vortices
[MPIS-6/1979] N80-14369
FLOW EQUATIONS
Numerical methods for a porous medium equation
[ANL-79-80] N80-14365
Approximate and exact numerical integration of the gas dynamic equations
[NASA-CR-162554] N80-14814
FLOW GEOMETRY
Investigation of coherent structures in the velocity field of a fully developed turbulent channel flow using flow visualization and anemometry
[MPIS-MITT-46] N80-14366
FLOW MEASUREMENT
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615] N80-14049
Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg — Langley 12-foot low speed wind tunnel test
[NASA-TM-80199] N80-14110
Design and performance of the drag-disc turbine transducer
[CONF-790655-2] N80-14347
Efficient laser anemometer for intra-rotor flow mapping in turbomachinery
[NASA-TM-79320] N80-14375
Measurement of fluid motion in a diesel engine cylinder by use of a tracer gas technique
N80-14399
FLOW STABILITY
On the question of instabilities upstream of cylindrical bodies
[NASA-CR-3231] N80-14357
Stability of a flat wall jet
[REPT-79-5] N80-14370
Instability of gravity waves in a shear flow
N80-14607
Langmuir circulations as a convective instability mechanism and its effect on the ocean mixed layer
N80-14662
FLOW VELOCITY
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323] N80-14050
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels — for gas velocity measurement
[AD-A074244] N80-14145
FLOW VISUALIZATION
Visualization of natural convection in flat plate solar collectors
N80-14476

FLUID DYNAMICS
Measurement of fluid motion in a diesel engine cylinder by use of a tracer gas technique
N80-14399
Acoustic equations in moving fluids
N80-14860
FLUID TRANSMISSION LINES
Energy analysis of the basic materials utilized in electric power transmission systems [HCP/T3043-01] N80-14510
FLUIDIZED BED PROCESSORS
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results [PB-299473/0] N80-14595
FLUOROCARBONS
Synthesis and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14246
Experiments to show the existence of the liquefaction shock wave in retrograde gases [MPIS-MITT-67] N80-14347
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes [NASA-CR-162537] N80-14689
FLUTTER ANALYSIS
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom [NASA-TM-80153] N80-14055
Excitation and analysis technique for flight flutter tests [MBB-UF-1446[O]] N80-14140
FLUX DENSITY
Acoustic Energy
N80-14866
FLY BY WIRE CONTROL
Redundancy management considerations for a control-configured fighter aircraft triplex digital fly-by-wire flight control system
N80-14026
Stability and control aspects of the CCV-F104G [MBB-UFE-1447[O]] N80-14141
FLYBY MISSIONS
Pioneer Saturn encounter news briefing [NASA-TM-80353] N80-15009
FLYING PERSONNEL
Problems related to medical criteria for the selection of military navigation personnel
N80-14679
FOG
Fugitive and fine particle control using electrostatically charged fog [PB-298069/6] N80-14593
Relationships between ir extinction, absorption and liquid water content of fogs [AD-A074395] N80-14653
FORESTS
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York
N80-14424
Forester's guide to aerial photo interpretation — timber inventory
N80-14425
FORMAT
Fractional design specification: NASA form 1510 [NASA-CR-162513] N80-14955
FORTRAN
FORTRAN for avionics
N80-14022
FORTRAN subroutines for out-of-core solutions of large complex linear systems [NASA-CR-159142] N80-14773
Two FORTRAN programs for the computation of the mean beam pattern of a perturbed array
N80-14780
FOURIER ANALYSIS
An X-ray study of the region around static and fatigue cracks
N80-14411
FOURIER TRANSFORMATION
Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086
FRACTIONATION
Electrophoretic fractional elution apparatus employing a rotational seal fraction collector [NASA-CASE-MFS-23284-1] N80-14397
FRACTURE MECHANICS
Acoustic emission: An application to fracture mechanics
N80-14410
Preliminary results of penetrator field test program, Tonopah, Nevada, 16-28 April 1979 [NASA-TM-58222] N80-15012
FRACTURE STRENGTH
Fracture strength of silicon solar cells [NASA-CR-162540] N80-14490
FREE ATMOSPHERE
Gravimetric vertical deflection determination for the North Sea regions [GVDNS 1] — study of free atmosphere gravity anomalies [SER-B-235] N80-14622
FREE VIBRATION
Triaxial measurement of stress waves in the free-field [SAND-78-2123C] N80-14420
FRENCH SPACE PROGRAMS
French space programs
N80-14165
FREQUENCY DIVISION MULTIPLEXING
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers [AD-A073356] N80-14306
FREQUENCY SHIFT
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency [NASA-CR-162525] N80-14878
FREQUENCY SHIFT KEYING
Communication application of adaptive arrays [AD-A074558] N80-14307
FREQUENCY STABILITY
The influence of transmitter stability on primary radar performance
N80-14084
FREQUENCY SYNTHESIZERS
The microprocessor-based synthesizer controller
N80-14362
FRICTION
Characteristics of disc springs in combination [to be used in conjunction with item no. 78043] [ESDU-79010] N80-14396
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems [NASA-CR-162556] N80-14842
FUEL CELLS
Solid electrolyte fuel cell for electric power generation — nonaqueous electrolyte fuel cells development for electric power plants [BNL-26230] N80-14522
Fuel cell option [CONF-780917-1] N80-14523
Applications of fuel cells in transportation [LA-UR-79-628] N80-14526
FUEL COMBUSTION
NASA broad-specification fuels combustion technology program: Status and description [NASA-TM-79315] N80-14126
Exhaust emission reduction for intermittent combustion aircraft engines [NASA-CR-159[illegible]] N80-14130
Status of the DOE/NASA critical gas turbine research and technology project [NASA-TM-79307] N80-14493
FUEL CONSUMPTION
Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment — flight tests of an algorithm to minimize fuel consumption of aircraft based on flight time [NASA-TM-80194] N80-14114
US energy flow in 1978
N80-14517
Evaluation of fuel resources and requirements for the magnetic fusion energy program [MLM-2419] N80-14570
Ambient temperature, fuel economy, emissions, and trip length [PB-298847/3] N80-14976
FUEL TANKS
Liquid weighing by buoyancy technique [GEFR-SP-156] N80-14836
FUEL-AIR RATIO
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines [NASA-TP-1582] N80-14125
FUNCTIONALS
Computation of moments of functionals of a solution to a stochastic differential equation [CSIR-TWISK-73] N80-14813
FUNGI
Fusarium species: Their potential for transforming biomass to ethanol [ANL/EES-TM-38] N80-14271
FUSELAGES
Experimental and numerical results of sound scattering by a body — interaction of aerodynamic noise and fuselage
N80-14873
FUSION REACTORS
Very small aspect ratio tokamaks [CONF-780811-32] N80-14924

G

GALACTIC CLUSTERS
Diffuse X-ray emission from Abell clusters
N80-14987
The structure and evolution of X-ray clusters of galaxies
N80-14998
The velocity of clusters of galaxies relative to the microwave background. The possibility of its measurement [PR-481] N80-15007
GALACTIC EVOLUTION
The structure and evolution of X-ray clusters of galaxies
N80-14998
GALAXIES
Einstein observations of extended galactic X-ray sources
N80-14996
Einstein observations of active galaxies and quasars
N80-14997
Columbia/Einstein observations of galactic X-ray sources [CONTRIB-179] N80-14999
GALILEO PROBE
Galileo probe thermal protection: Entry heating environments and ejectable experiments design [NASA-CR-152334] N80-14384
GALLIUM ARSENIDE LASERS
Determination of the velocity-field characteristic of gallium arsenide from Franz-Keldysh electroabsorption
N80-14331
GAME THEORY
Two-target pursuit-evasion differential games in the plane — liapunov techniques [CSIR-TWISK-76] N80-14830
GAMMA RAYS
Gamma energy spectra for the RADC/ES cobalt 60 source [AD-A073257] N80-14891
X-ray emission from the region of gamma 195+5
N80-14986
GARNETS
Laser time-resolved site selections spectroscopy of Nd3+ ions in mixed garnet crystals
N80-14938
GAS CHROMATOGRAPHY
Volatile organic compounds in seawater — sources and transport mechanisms [AD-A074179] N80-14214
GAS DETECTORS
Approaches to CW agent area detection systems for airfields
N80-14720
GAS DYNAMICS
Approximate and exact numerical integration of the gas dynamic equation [NASA-CR-162554] N80-14834
GAS FLOW
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels — for gas velocity measurement [AD-A074244] N80-14145
Numerical methods for a porous medium equation [ANL-78-80] N80-14365
GAS INJECTION
Hydrodynamical aspects of low flow vapor injection into subcooled water
N80-14353
Ozonation of cooling tower waters [NASA-CASE-NPO-14340-1] N80-14579
GAS MIXTURES
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines [NASA-TP-1582] N80-14125
GAS TURBINE ENGINES
Digital system for dynamic turbine engine blade displacement measurements [NASA-TM-81382] N80-14113
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines [NASA-TP-1582] N80-14125
NASA broad-specification fuels combustion technology program: Status and description [NASA-TM-79315] N80-14126
Laser-optical blade tip clearance measurement system [NASA-TM-81376] N80-14128
Temperature and pressure measurement techniques for an advanced turbine test facility [NASA-TM-79278] N80-14374
Contact stress analysis of ceramic-to-metal interfaces — in gas turbine engines [AD-A074491] N80-14417
GAS TURBINES
Feasibility of SiC composite structures for 1644 K [2500 F] gas turbine seal application [NASA-CR-159597] N80-14122
Status of the DOE/NASA critical gas turbine research and technology project [NASA-TM-79307] N80-14493
GAS-LIQUID INTERACTIONS
Hydrodynamical aspects of low flow vapor injection into subcooled water
N80-14353
GAS-METAL INTERACTIONS
Kinetic aspects of gas phase metal atom oxidation reactions — laser design [AD-A074089] N80-14387
GAS-SOLID INTERACTIONS
An extended soft-cube model for the thermal accommodation of gas atoms on solid surfaces [NASA-TM-81163] N80-14941
GASEOUS FUELS
Liquefied gaseous fuels safety and environmental control assessment program [DOE/EV-0036] N80-14266
GASIFICATION
Pilot plant gasification test on biomass fuels [PB-299077/8] N80-14272

GELS
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074183] N80-14252
GENERAL AVIATION AIRCRAFT
Meteorological input to general aviation pilot training
N80-14634
Accident investigation
N80-14636
GEOCHEMISTRY
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559] N80-15013
GEODESY
Proceedings of Second International Symposium on Problems Related to the Redefinition of North American Geodetic Networks — conference
[PB-299260/0] N80-14623
GEODETIC COORDINATES
Proceedings of Second International Symposium on Problems Related to the Redefinition of North American Geodetic Networks — conference
[PB-299260/0] N80-14623
GEODETIC SURVEYS
Three dimensional adjustment of the 'Western Hurr' test network
[SER-B-234] N80-14460
Crustal deformation in central California: Multi-wavelength geodetic observations and interpretations
N80-14605
GEOGRAPHY
Three types of geographic data structure: Similitudes, differences, and possible synthesis
N80-14436
Geographic information systems: A review, with discussion of future developments
N80-14437
A program for the design of geographical maps
N80-14438
GEOLOGICAL FAULTS
Crustal deformation in central California: Multi-wavelength geodetic observations and interpretations
N80-14605
GEOMAGNETISM
Power spectra of geomagnetic fluctuations between 0.4 and 40 Hz
[AD-A074378] N80-14616
GEOPHYSICS
Solar-geophysical data number 412, December 1978. Part 1: Prompt reports, data for November 1978, October 1978
[PB-302877/4] N80-15019
Solar-geophysical data number 412, December 1978. Part 2: Comprehensive reports, data for June-May 1978, and miscellanea
[PB-300878/4] N80-15020
Solar-geophysical data number 419, July 1979. Part 1: Prompt reports, data for June 1979, May 1979
[PB-300836/4] N80-15021
Solar-geophysical data number 419, July 1979. Part 2: Comprehensive reports, data for January 1979, December 1978
[PB-300837/2] N80-15022
GEORGIA
Meteor wind over Atlanta, 34 deg north, 84 deg west
N80-14628
GEOTHERMAL ENERGY CONVERSION
Commercialization strategy report for hydrothermal electric and direct heat application — project planning of geothermal resources for geothermal energy conversion for heating electricity generation
[TID-2804-DRAFT] N80-14508
Lawrence Livermore Laboratory geothermal energy program: A status report on the development of the Total-Flow concept
[UCRL-50046-77] N80-14529
Preliminary design of axial flow hydrocarbon turbine/generator set for geothermal applications
[EPRI-ER-513] N80-14536
Geothermal energy: Program summary
[DOE/ET-0101] N80-14542
Geothermal energy market study on the Atlantic coastal plain. Economic evaluation model for direct use of moderate temperature, up to 250 F, geothermal resources in the northern Atlantic coastal plain
[PB-298785/7] N80-14578
GEOTHERMAL RESOURCES
Energy from the West: Energy resource development systems report. Volume 6: Geothermal
[PB-299182/6] N80-14468
Deep terrestrial heat flow measurements in New Mexico and neighboring geologic areas
[PB-299489/5] N80-14471
Commercialization strategy report for hydrothermal electric and direct heat application — project planning of geothermal resources for geothermal energy conversion for heating electricity generation
[TID-2804-DRAFT] N80-14508
Geothermal energy market study on the Atlantic coastal plain. Economic evaluation model for direct use of moderate temperature, up to 250 F, geothermal resources in the northern Atlantic coastal plain
[PB-298785/7] N80-14578
Imperial Valley environmental project: Air quality assessment
[UCRL-52699] N80-14585
GERMANIUM ALLOYS
Heat capacity of amorphous and disordered Nb3Ge thin films
N80-14931
GERMANY
Establishment of a data base of the administrative boundaries of Germany, scale 1:500,000 to 1:1,000,000
N80-14434
FRG sitcrew chemical defence association
N80-14737
GLASS
Effect of silver on the structure and properties of arsenic-trisulfide glass
N80-14347
GLASS FIBERS
Evaluation of alternate vanadium compounds for use in fiberglass reinforced plastic soil surfacing
[AD-A074871] N80-14615
GLAUCOMA
Intra-ocular pressure normalization technique and equipment
[NASA-CASE-LEW-12955-1] N80-14684
GLOBAL ATMOSPHERIC RESEARCH PROGRAM
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX
[GARP-SPEC-REPT-32] N80-14656
Report of the Second Session of the WAMEX Scientific and Management Regional Committee
[GARP-SPEC-REPT-33] N80-14657
GLOBAL POSITIONING SYSTEM
Development of aiding GPS/strapdown inertial navigation system
N80-14031
Avionics installation [AVSTALL] cost model for user equipment of NAVSTAR global positioning system
[AD-A073681] N80-14106
GOVERNMENT PROCUREMENT
Assessing the output of Federal commercially financed R/D
[PB-299228/7] N80-14961
GOVERNMENT/INDUSTRY RELATIONS
The Space Industrialization Act of 1979
[GPO-50-404] N80-14970
GRAIN BOUNDARIES
Grain boundary structure and properties
[COO-5002-3] N80-14947
Diffusion induced grain boundary migration
[COO-5002-2] N80-14948
Diffusional mass transport in polycrystals containing stationary or migrating grain boundaries
[COO-5002-1] N80-14949
GRANULAR MATERIALS
Modified Weibull theory for the strength of granular brittle material
[GA-A-15228] N80-14421
GRAPHITE
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159166] N80-14197
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4693] N80-14200
Preliminary study of some graphite electrode surfaces responsive to iron and heavy metals by single-sweep voltammetry
[AD-A074605] N80-14343
GRAPHITE-EPOXY COMPOSITE MATERIALS
Quiet Clean Short-Haul Experimental Engine [QCSEE] Under-The-Wing [UTW] graphite/PMR cowl development
[NASA-CR-135279] N80-14119
Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79314] N80-14196
GRAPHS [CHARTS]
Information on cartography and geodesy. Series 1: Original report number 75
N80-14427
Graphical processing of areal related data. Program development done in Nordrhein-Westfalen
N80-14429
GRAVIMETRY
Gravimetric vertical deflection determination for the North Sea regions [GVDNS 1] — study of free atmosphere gravity anomalies
[SER-B-235] N80-14622
GRAVITY ANOMALIES
Gravimetric vertical deflection determination for the North Sea regions [GVDNS 1] — study of free atmosphere gravity anomalies
[SER-B-235] N80-14622
GRAVITY WAVES
Instability of gravity waves in a shear flow
N80-14607
GROUND STATIONS
Experience in producing software for the ground station of a remotely piloted helicopter system
N80-14038
The Earthnet programme — for the acquisition and distribution of LANDSAT satellite data
N80-14444
Calculation of the azimuth of the section between Hohenpeissenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig]
[SER-B-236] N80-14461
GROUND SUPPORT SYSTEMS
DOD STS ground support systems
[VCR-76-032-05] N80-14178
GROUND WATER
Groundwater resources of the Texas high plains: State-of-the-art and future research needs
[PB-298147/0] N80-14469
Surface water quality parameters for monitoring oil shale development
[PB-297984/7] N80-14470
GROUND WAVE PROPAGATION
Ground-wave propagation in a realistic terrain
[BRC-RD-1979/19] N80-14286
VHF and UHF propagation studies in the Canadian Arctic
[CRC-1327] N80-14288
GROUP DYNAMICS
A criterion validation of multiattribute utility analysis and of a group communication strategy
[AD-A073364] N80-14699
Extended analysis of small group performance and the effects of contingency management in a programmed environment
[AD-A069665] N80-14705
GROUT
A study of the influence of oil saturation on the 64 meter antenna hydrostatic bearing grout
N80-14159
GROWTH
Crop environment monitoring: The assessment of environmental phenomena using satellite remote sensing data
N80-14454
Microbial colonization of materials at Innisfail, Queensland
[MRL-TN-428] N80-14670
GUIDANCE SENSORS
An observer system for sensor failure detection and isolation in digital flight control systems
N80-14023
Automatic recovery after sensor failure onboard
N80-14024
GULF STREAM
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
GUST LOADS
Effect of spanwise gust variations
N80-14639
GUSTS
Investigation of the oscillatory and flight behavior of rotor systems in relation with atmospheric turbulence
[BMVG-FBWT-79-5] N80-14142

H

HADRONS
High energy hadron-nucleus collisions
[CU-TP-137] N80-14896
HAIL
The T-28 thunder/hailstorm penetration aircraft
N80-14640
HANDBOOKS
USAF bioenvironmental noise data handbook. Volume 125: F-105D aircraft, near and far-field noise
[AD-A073616] N80-14848
HARDENING [MATERIALS]
Surface hardening by laser skin melting
[AD-A074166] N80-14236
HARMONIC ANALYSIS
Identification of limit cycles in multinonlinearity, multiple path systems
N80-14333
Power spectra of geomagnetic fluctuations between 0.4 and 40 Hz
[AD-A074378] N80-14616
HARMONIC EXCITATION
Excitation and analysis technique for flight flutter tests
[MBB-UF-1446(O)] N80-14140
HARMONIC OSCILLATION
An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056
HARMONICS
Directivity of acoustic radiation from sources
N80-14863
HAZARDS
Investigation of noise hazards in the engine test cell, CFB Baden-Soellingen
[AD-A074391] N80-14147
Survey of solidification/stabilization technology for hazardous industrial wastes
[PB-299206/3] N80-14278
Hazardous properties and environmental effects of materials used in Solar Heating and Cooling [SHAC] technologies: Interim handbook
[DOE/EV-0028] N80-14565
HEAO 1
HEAO Science Symposium
[NASA-CP-2113] N80-14977
X-ray variability observed with HEAO A-1
N80-14978

Program of the HEAO A-1 catalog — all sky map of X-ray sources
N80-14979
The scientific results of the low energy portion of A-2
N80-14980
HEAO A-2 extragalactic results
N80-14981
A-3 scientific results
N80-14982
A-3 scientific results - extragalactic
N80-14983
High energy X-ray results from HEAO-1: X-ray pulsars, and the all sky survey
N80-14984
A-4 scientific results
N80-14985
X-ray emission from the region of gamma 195+5
N80-14986
Correlated ground based observations in support of the HEAO-1 X-ray observatory
N80-14988
The HEAO-1 neutron star timing experiment
N80-14989
X-ray iron-line emission from the SN 185 remnant
N80-14990
Optical identification and spectroscopy of X-ray sources precisely positioned with A-3
N80-14991

HEAO 2
HEAO Science Symposium
[NASA-CP-2113]
N80-14977
A high energy astronomy overview
N80-14992
Nondispersive spectroscopy of celestial X-ray sources
N80-14993
High resolution X-ray spectroscopy on the Einstein Observatory
N80-14994
Monitor proportional counter
N80-14995
Einstein observations of extended galactic X-ray sources
N80-14996
Einstein observations of active galaxies and quasars
N80-14997
The structure and evolution of X-ray clusters of galaxies
N80-14998
Columbia/Einstein observations of galactic X-ray sources
[CONTRIB-179]
N80-14999
Columbia/Einstein observations of extragalactic X-ray sources
[CONTRIB-180]
N80-15000

HEARING
Derivation of presbycusis and Noise Induced Permanent Threshold Shift [NIPTS] to be used for the basis of a standard on the effects of noise on hearing
[AD-A071310]
N80-14690

HEART RATE
Handling qualities, workload and heart rate
N80-14750

HEAT EXCHANGERS
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188]
N80-14046

HEAT MEASUREMENT
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211]
N80-14267

HEAT PIPES
Meteoroid protection methods for spacecraft radiators using heat pipes
[NASA-CR-162545]
N80-14185

HEAT PUMPS
Dissociation pressure measurements on salts proposed for thermochemical energy storage
[SAND-79-8033]
N80-14532
Commercial solar augmented heat pump system
[EPRI-ER-1004]
N80-14537

HEAT SHIELDING
Galileo probe thermal protection: Entry heating environments and ablation experiments design
[NASA-CR-152334]
N80-14184

HEAT STORAGE
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162544]
N80-14484
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-8431]
N80-14533
Thermal energy storage for solar applications: An overview
[SERI/TP-34-089]
N80-14546

HEAT TOLERANCE
Three instruments for assessment of WBGT and a comparison with WGT [BOTSBALL]
[AD-A074979]
N80-14691

HEAT TRANSFER
Potential heat exchange fluids for use in sulfuric acid vaporizers
[NASA-CR-162548]
N80-14358

HEAT TRANSMISSION
Deep terrestrial heat flow measurements in New Mexico and neighboring geologic areas
[PB-299489/5]
N80-14471

HEATING
Commercialization strategy report for hydrothermal electric and direct heat application — project planning of geothermal resources for geothermal energy conversion for heating electricity generation
[TID-2884-DRAFT]
N80-14508

HELICOPTERS
Experience in producing software for the ground station of a remotely piloted helicopter system
N80-14038
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations — conducted in the Langley V/STOL tunnel
[NASA-TP-1600]
N80-14840

HELIOSTATS
Wind tunnel test of a full-scale heliostat
[SAND-79-8034]
N80-14536
HELIOS and reconcentrator — computer program for simulation of solar collectors, concentrators, and heliostats
[SAND-78-1600C]
N80-14537

HELIUM
Sound velocity and equation-of-state measurements in high pressure fluid and solid helium
[LA-UR-79-721]
N80-14856
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420]
N80-14920

HELIUM ISOTOPES
Ordering transitions in helium-4 submonolayers: A heat capacity study
N80-14934

HELMHOLTZ EQUATIONS
Modular programs for the fast solving of linear elliptic equations by reduction methods: TR2D01, TR2D02 to solve the Dirichlet problem for Helmholtz equation; user's manual concerning the club MODULEF
[GMD-MITT-47]
N80-14781

HEMATOLOGY
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants
N80-14686

HEMODYNAMICS
Effect of prolonged hypokinesia on tissue blood flow
[NASA-TM-76005]
N80-14688

HETEROJUNCTION DEVICES
Recent investigations of metal oxide/CdTe heterojunction solar cells
[CONF-780619-25]
N80-14564

HEURISTIC METHODS
Limits and adjoint situations in mathematical structures
[CSIR-TWISK-67]
N80-14809

HIERARCHIES
The IMS data storage hierarchy: DSH-2
[AD-A073379]
N80-14966

HIGH ENERGY INTERACTIONS
Interaction of fast molecular ions with matter
[CONF-790524-8]
N80-14889
High energy hadron-nucleus collisions
[CU-TP-137]
N80-14896
Superconducting magnets in high energy physics
[BNL-24818]
N80-14897

HIGH FREQUENCIES
High frequency broadband rotor noise — method to find level of high frequency broadband aircraft noise due to rotary wings
N80-14838

HIGH PRESSURE
Measurement of the radiative properties of air at high temperatures and pressures
[AD-A074825]
N80-14218
High pressure ceramic heat exchanger. Phase I: Deadhead experimental verification
[COO-4236-3]
N80-14364
Sound velocity and equation-of-state measurements in high pressure fluid and solid helium
[LA-UR-79-721]
N80-14856

HIGH RESOLUTION
High resolution threshold photoelectron spectroscopy by electron attachment
[NASA-CASE-NPO-14078-1]
N80-14877
High resolution magnetic spectrometer for antiproton physics at rest and low energies
[BNL-24462]
N80-14890
The high spatial resolution of interferometry in the near infrared — infrared to astronomy
N80-15005

HIGH SPEED
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation
[AD-A073859]
N80-14388
Comparison of high speed printer interface characteristics
[PB-299943/2]
N80-14767

HIGH STRENGTH ALLOYS
High strength austenitic alloys for generator retaining rings
[EPRI-FP-1061]
N80-14239

HIGH TEMPERATURE
Measurement of the radiative properties of air at high temperatures and pressures
[AD-A074825]
N80-14218

HIGH TEMPERATURE ENVIRONMENTS
Feasibility of SiC composite structures for 1644 K [2500 F] gas turbine seal application
[NASA-CR-159597]
N80-14122

HIGH TEMPERATURE TESTS
High temperature UF6 RF plasma experiments applicable to uranium plasma core reactors
[NASA-CR-159159]
N80-14921
Regolith layering processes based on studies of low-temperature volatile elements in Apollo core samples
[CONF-790381-1]
N80-15016

HIGH VOLTAGES
Interaction of high voltage surfaces with the space plasma — solar arrays
[NASA-CR-159731]
N80-14923

HOLES
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U]
N80-14413

HOLOGRAPHY
Vibration analysis and nondestructive testing using double-exposure holographic techniques
[AD-A073457]
N80-14415

HOMOMORPHISMS
Homomorphic processing of seismic signals
[LA-7876-MS]
N80-14620

HOMOTOPY THEORY
Strong shape theory
N80-14802

HOSPITALS
User requirements for a patient scheduling system
[NASA-CR-162539]
N80-14956

HOUSTON [TX]
Houston area oxidants study, program summary
[PB-299638/7]
N80-14598
Aerometric data analysis for the Houston area oxidant study. Volume 3: Data summaries for the Houston area oxidant study
[PB-299649/4]
N80-14602

HOVERING
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615]
N80-14049

HUMAN BEHAVIOR
A study in procedural manipulation of locus of control
[AD-A068658]
N80-14704
Rule learning and systematic instruction in pilot training
[AD-A068906]
N80-14709
Rating errors of inconsistency as a function of dimensionality of behavioral anchors
[AD-A068922]
N80-14710
A mind/brain/matter model consistent with quantum physics and UFO phenomena
[AD-A068948]
N80-14711

HUMAN BODY
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants
N80-14686
Design criteria for characterizing individuals in the extreme upper and lower body size ranges
[AD-A072353]
N80-14721

HUMAN FACTORS ENGINEERING
Three instruments for assessment of WBGT and a comparison with WGT [BOTSBALL]
[AD-A074979]
N80-14691
Anthropometric sizing, fit-testing and evaluation of the MBU-12/P oral-nasal oxygen mask
[AD-A074723]
N80-14692
Importance weight assessment for additive, riskless preference functions: A review
[AD-A073365]
N80-14700
Effect of peripherally presented visual signals on pilot performance during flight simulation
[AD-A073604]
N80-14703
Extended analysis of small group performance and the effects of contingency management in a programmed environment
[AD-A068665]
N80-14705
Ability, involvement and climate as multiple and interactive predictors of performance
[AD-A068891]
N80-14706
Methodological and conceptual issues in understanding ability-performance relationships
[AD-A068894]
N80-14708
Rule learning and systematic instruction in pilot training
[AD-A068906]
N80-14709
Technologies for the handicapped and the aged
[NASA-TM-80842]
N80-14715
Methods for evaluating the physical and effort requirements of Navy tasks: Metabolic, performance, and physical ability correlates of perceived effort
[AD-A072497]
N80-14720
FRG aircrew chemical defence assemblies
N80-14737
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738

Aircrew workload assessment techniques — human factors engineering study of performance of flight crews workloads
N80-14746
Quantitative military workload analysis
N80-14748
Visual performance: A method to assess workload in the flight environment
N80-14749
Handling qualities, workload and heart rate
N80-14750
User requirements for a patient scheduling system [NASA-CR-162339] N80-14956
HUMAN PERFORMANCE
Extended analysis of small group performance and the effects of contingency management in a programmed environment [AD-A080665] N80-14705
Ability, involvement and climate as multiple and interactive predictors of performance [AD-A080891] N80-14706
Work performance as a function of the interaction of ability, work values, and the perceived work environment [AD-A080899] N80-14707
Methodological and conceptual issues in understanding ability-performance relationships [AD-A080894] N80-14708
Rating errors of inconsistency as a function of dimensionality of behavioral anchors [AD-A080922] N80-14710
Sleep and body rhythm disturbance in long-range aviation. The problem and a search for relief
N80-14714
Methods for evaluating the physical and effort requirements of Navy tasks: Metabolic, performance, and physical ability correlates of perceived effort [AD-A072497] N80-14720
Individual and system performance indices for the air traffic control system
N80-14756
Assessment correlates of workload and performance
N80-14758
HUMAN TOLERANCES
Investigation of noise hazards in the engine test cell, CFB Bad'en-Soellingen [AD-A074391] N80-14147
HURRICANES
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan [WMO-524] N80-14658
HYDRAULIC EQUIPMENT
Biaxial bending analysis of hydraulic cylinders
N80-14489
HYDROCARBON COMBUSTION
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion — models for environmentally clean power plant design [COO-4272-3] N80-14587
HYDROCARBON FUELS
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion — models for environmentally clean power plant design [COO-4272-3] N80-14587
HYDROCARBONS
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K [AD-A074264] N80-14215
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes [NASA-CR-162537] N80-14689
HYDRODYNAMICS
Hydrodynamic and electrostatic characterization of particles by light scattering
N80-14209
Polystyrene in mixed solvents
N80-14245
Hydrodynamical aspects of low flow vapor injection into subcooled water
N80-14353
Hydraulic jumps in a partially filled rotating cylinder [K/TS-2936] N80-14362
Self-acting lift-pad geometry for circumferential seals: A noncontacting concept — performance tests on hydrodynamic seals [NASA-TP-1583] N80-14403
HYDROGEN
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
HYDROGEN ATOMS
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K [AD-A074264] N80-14215
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency [NASA-CR-162525] N80-14878
HYDROGEN IONS
Formation of hydrogen negative ions by surface and volume processes with application to negative ion sources [UCRL-82899] N80-14887
Investigation of molybdenum impurity diffusion during hydrogen gas puffing in JIPP T-II plasma [IPPJ-412] N80-14915
HYDROGEN OXYGEN ENGINES
Performance of a transpiration-regenerative cooled rocket thrust chamber [NASA-CR-159742] N80-14189
HYDROGEN PLASMA
Measurement of the ion profile by stationary CO2 laser scattering from a hydrogen plasma [IPF-78-5] N80-14926
Light scattering from an arc plasma with stationary CO2 laser and heterodyne detection [IPF-78-8] N80-14928
HYDROGEN PRODUCTION
Development of the steam-iron process for hydrogen production, 9010 [FE-2435-32] N80-14258
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4 [CONF-780807-11] N80-14265
Process design and economic analysis of the zinc selenide thermochemical hydrogen cycle [UCRL-52546] N80-14571
HYDROGEN-BASED ENERGY
Proceedings of the DOE chemical/hydrogen energy contractor review systems [CONF-771131] N80-14572
HYDROGENATION
Hydrogenation catalysts derived from Mo[CO]6/alumina
N80-14208
HYDROGEOLOGY
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-A: Compendium of work element reports [PB-299686/6] N80-14588
HYDROGRAPHY
Operating scenario for a Hydrographic Airborne Laser Sounder [HALS] [AD-A073872] N80-14390
Cartographic automation status in a German hydrographic institute
N80-14433
The cost effectiveness of airborne laser hydrography [PB-299057/0] N80-14668
HYDROLOGY
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977. [CNEXO-16-1978] N80-14667
HYDROLOGY MODELS
Crop weather models: Concepts and applications
N80-14450
HYDROLYSIS
Process design and economic analysis of the zinc selenide thermochemical hydrogen cycle [UCRL-52546] N80-14571
HYDROSTATIC PRESSURE
A study of the influence of oil saturation on the 64 meter antenna hydrostatic bearing grout
N80-14139
HYPERSONIC FLOW
Study of the formation of laminar flow separation induced by the deflection of a control surface — during hypersonic wind tunnel tests [REPT-79-2] N80-14060
HYPODYNAMIA
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization [NASA-TM-75983] N80-14672
The effects of hypodynamia and hypokinesia on the arterial bed of pelvic limb muscles in the rabbit [NASA-TM-75984] N80-14673
HYPOKINESIA
The effects of hypodynamia and hypokinesia on the arterial bed of pelvic limb muscles in the rabbit [NASA-TM-75984] N80-14673
Effect of prolonged hypokinesia on tissue blood flow [NASA-TM-76005] N80-14688

I

ICE
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation [AD-A073859] N80-14388
ICE PREVENTION
Construction of an ice-retardant overlay — asphalt additive [PB-298876/4] N80-14274
IMAGE ENHANCEMENT
Restoration and enhancement of images observed in multiplicative noise
N80-14770
IMAGE PROCESSING
Image transmission via spread spectrum techniques — synthetic aperture radar [AD-A074606] N80-14308
Charge-coupled device architectures for signal processing
N80-14334
SCANLINE: A computer program for converting raster maps into line maps [CSIR-TWISK-43] N80-14426
Meteorsat and remote sensing application
N80-14448
On-board multispectral classification study [NASA-CR-3134] N80-14760
Restoration and enhancement of images observed in multiplicative noise
N80-14770
Image processing system software. Volume 1: Users manual [AD-A073652] N80-14775
Image processing system software. Volume 2: Programmers manual [AD-A073653] N80-14776
Analysis of techniques for imaging through the atmosphere — speckle imagery for deep space object identification [AD-A073640] N80-14901
The fundamentals of thermal imaging systems — study of infrared imagery, image processing, photometry, and imaging techniques [AD-A073763] N80-14902
IMAGE TUBES
Visual displays for air traffic control data
N80-14077
IMAGING TECHNIQUES
Imaging in a Fabry-Perot interferometer
N80-14898
The fundamentals of thermal imaging systems — study of infrared imagery, image processing, photometry, and imaging techniques [AD-A073763] N80-14902
IMINES
Preparation and catalytic oxidizing potential of polymer supported chelating amine and Schiff base complexes [AD-A073878] N80-14250
IMPACT TESTS
Off-center, low velocity, transverse normal impact of a simply supported plate [AD-A074946] N80-14416
X-ray diffraction studies of shocked lunar analogs [NASA-CR-162555] N80-15011
Preliminary results of penetrator field test program, Tonopah, Nevada, 16-28 April 1979 [NASA-TM-58222] N80-15012
IMPURITIES
Electrical compensation in InP produced by background impurities and structural defects [AD-A074178] N80-14945
INCENTIVE TECHNIQUES
Implementation of state solar incentives: Land-use planning to ensure solar access [SERI/TR-51-163] N80-14519
Implementation of state solar incentives: A preliminary assessment [SERI/TR-51-159] N80-14520
INCENTIVES
Photovoltaic incentives options [HCP/CS-0023] N80-14561
INDICATING INSTRUMENTS
Preliminary investigation of pilot scanning techniques of dial pointing instruments [NASA-TM-80079] N80-14697
INDIUM PHOSPHIDES
The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis [AD-A073421] N80-14942
Electrical compensation in InP produced by background impurities and structural defects [AD-A074178] N80-14945
INDUCTANCE
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1 [RAE-TR-2021] N80-14376
INDUCTORS
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation [IPPJ-32] N80-14917
INDUSTRIAL ENERGY
Energy conservation in the US economy from increased recycle of obsolete steel scrap [COO-2893-10] N80-14524
INDUSTRIAL WASTES
Survey of solidification/stabilization technology for hazardous industrial wastes [PB-299206/3] N80-14278
Development of treatment and control technology for refractory petrochemical wastes [PB-299291/3] N80-14596
INELASTIC SCATTERING
Topics in the QCD phenomenology of deep-inelastic scattering [SLAC-PUB-2296] N80-14950
INERTIAL NAVIGATION
A redundant inertial navigation system for IUS
N80-14029

Development of aiding GPS/strapdown inertial navigation system
N80-14031
Methods for strap-down attitude estimation and navigation with accelerometers
N80-14034
A high accuracy flight profile determining system — systems analysis of inertial navigation system for aircraft position determination
N80-14042
INERTIAL UPPER STAGE
A redundant inertial navigation system for IUS
N80-14029
INFERENCE
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702
A general solution to making inferences about the parameters of mixed linear models
N80-14826
INFORMATION DISSEMINATION
The Earthnet programme — for the acquisition and distribution of LANDSAT satellite data
N80-14444
INFORMATION MANAGEMENT
Functional design specification: NASA form 1510
[NASA-CR-162513] N80-14955
The IMS data storage hierarchy: DSH-2
[AD-A073376] N80-14966
INFORMATION SYSTEMS
The Earthnet programme — for the acquisition and distribution of LANDSAT satellite data
N80-14444
The IMS data storage hierarchy: DSH-2
[AD-A073376] N80-14966
INFRARED ABSORPTION
Relationships between ir extinction, absorption and liquid water content of fogs
[AD-A074395] N80-14653
INFRARED ASTRONOMY
Planetary astronomy — asteroids, planets, and protoplanets
[NASA-CR-162526] N80-15003
The high spatial resolution of interferometry in the near infrared — infrared to astronomy
N80-15005
INFRARED DETECTORS
Antenna-coupled infrared detectors
[AD-A074085] N80-14320
Passing infrared surveillance - new methods of analysis
[AD-A074742] N80-14904
Infrared measurements of vehicles and weapons
[AD-A074467] N80-14905
INFRARED IMAGERY
The application of thermal infrared remote sensing data to soil moisture and evaportation determination
N80-14447
A study of the relationship between oceanic chemical mesoscale and sea surface thermal structure as detected by satellite infrared imagery
[AD-A074186] N80-14663
The fundamentals of thermal imaging systems — study of infrared imagery, image processing, photometry, and imaging techniques
[AD-A073763] N80-14902
Development of charge transfer devices for 1-2 micron imaging
[AD-A074653] N80-14903
INFRARED INTERFEROMETERS
Infrared interferometric thickness measurement of polymeric thin films and coatings
[Y-2176] N80-14254
The high spatial resolution of interferometry in the near infrared — infrared to astronomy
N80-15005
INFRARED LASERS
Infrared laser window coating by plasma polymerization
[AD-A075008] N80-14393
INFRARED RADIATION
An electron diffraction study of laser excited sulfur hexafluoride
N80-14207
INFRARED SCANNERS
Study and investigation of infrared multispectral target cueing techniques
[AD-A074799] N80-14458
Passing infrared surveillance - new methods of analysis
[AD-A074742] N80-14904
INFRARED SPECTRA
The 0.1 wavenumber spectral measurements in the region from 2050 - 2410 wavenumbers of a static, experimental rocket motor at three pressure altitudes
[AD-A073704] N80-14191
Isometrically deformable synclastic surfaces as flexible waveguides
N80-14335
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074913] N80-14944
INFRARED SPECTROSCOPY
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220
INGOTS
Assessment of present state-of-the-art sawing technology of large diameter ingots for solar sheet material
[NASA-CR-162515] N80-14273
INHOMOGENEITY
Fundamentals of sound reflection and refraction in inhomogeneous media — atmospheric propagation
N80-14861
Non-axial-symmetric Alfven waves in cylindrical, radial inhomogeneous plasma
[IPF-78-6] N80-14927
INPUT/OUTPUT ROUTINES
Modular programs for the fast solving of linear elliptic equations by reduction methods: TR2D01, TR2D02 to solve the Dirichlet problem for Helmholtz equation; user's manual concerning the club MODULEF
[GMD-MITT-47] N80-14781
Functional design specification: NASA form 1510
[NASA-CR-162513] N80-14955
INSOLATION
Insolation models, data and algorithms
[SERI/TR-36-110] N80-14617
Urban-rural insolation correlation study — air pollution over metropolitan St. Louis
[DOE/ET-0092] N80-14618
INSTALLING
Problems and installation technique of the transmitting media of a circular waveguide link
N80-14298
INTAKE SYSTEMS
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728] N80-14227
INTEGRAL EQUATIONS
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-598] N80-14790
Solution of electromagnetic boundary value problems of complicated structures. Theory of the integral equation method
[ESA-TT-596] N80-14820
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
INTEGRATED CIRCUITS
A computer-aided design system for custom large-scale integrated circuits
N80-14158
Method for analyzing radiation sensitivity of integrated circuits
[NASA-CASE-NPO-14350-1] N80-14332
INTEGRATED ENERGY SYSTEMS
High-BTU coal gasification processes
[ANL/CES/TE-79-2] N80-14263
INTEGRATED OPTICS
Thick film fiber optics to integrated optics interface
[EGG-1183-5104] N80-14907
INTERFACES
Bootstrapping for a BCPL compiler
[REPT-271] N80-14792
INTERFACIAL TENSION
Hydrodynamical aspects of low flow vapor injection into subcooled water
N80-14353
INTERFEROMETRY
Imaging in a Fabry-Perot interferometer
N80-14898
Speckle interferometry for a partially coherent source
[AD-A074540] N80-15004
INTERGALACTIC MEDIA
Columbia/Einstein observations of extragalactic X-ray sources
[CONTRIB-180] N80-15000
INTERMEDIATE FREQUENCIES
Ground-wave propagation in a realistic terrain
[DBC-RD-1979/19] N80-14286
INTERNAL WAVES
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
INTERNATIONAL COOPERATION
A review of NASA international programs
[NASA-TM-80845] N80-14971
INTERNATIONAL SUN EARTH EXPLORER 3
Real-time ISEE data system
[NASA-CR-162549] N80-14173
INTERPLANETARY DUST
Studies of interplanetary dust — study by satellite observation of interplanetary dust from micrometeoroids
N80-15006
INTRAOCULAR PRESSURE
Intra-ocular pressure normalization technique and equipment
[NASA-CASE-LEW-12955-1] N80-14684
INVARIANCE
Spectral invariance for normal operations under trace class perturbations
N80-14803
INVISCID FLOW
The calculation of inviscid separated flow about a slender cone for large angles of attack
[RAE-TR-2009] N80-14360
IODINE
Iodine stress-corrosion cracking in irradiated Zircaloy cladding
[CONF-790441-7] N80-14237
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4
[CONF-780807-11] N80-14245
ION ATOM INTERACTIONS
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420] N80-14920
ION BEAMS
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines
[ONERA-RTS-1/3127-EY] N80-14195
ION DENSITY [CONCENTRATION]
Measurement of the ion profile by stationary CO2 laser scattering from a hydrogen plasma
[IPF-78-5] N80-14926
ION EXCHANGE RESINS
Dialysis system — using ion exchange resin membranes permeable to urea molecules
[NASA-CASE-NPO-14101-1] N80-14687
ION SELECTIVE ELECTRODES
Investigation of effects of temperature, salinity, and electrode design on the performance of an electrochemical coliform detector
[NASA-TM-80130] N80-14676
ION SOURCES
Formation of hydrogen negative ions by surface and volume processes with application to negative ion sources
[UCRL-82889] N80-14887
ION TEMPERATURE
Ion heating by the current-driven turbulence in an inhomogeneous plasma
[IPPJ-423] N80-14911
IONIC COLLISIONS
Interaction of fast molecular ions with matter
[CONF-790524-8] N80-14889
IONIC DIFFUSION
Investigation of molybdenum impurity diffusion during hydrogen gas puffing in JIPP T-11 plasma
[IPPJ-412] N80-14915
IONIZING RADIATION
Early transient incapacitation: A review with consideration of underlying mechanisms
[AD-A071803] N80-14693
IONOSONDES
VLF/LF reflectivity of the polar ionosphere, 3 September - 30 December 1978
[AD-A074475] N80-14317
IONOSPHERE
Planetary ionospheres
N80-14612
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar
[NASA-CR-162558] N80-15025
IONOSPHERIC COMPOSITION
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionospheres. Conference, Germany Jul. 1975
[REPT-55/1977] N80-14609
IONOSPHERIC DISTURBANCES
An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique — experiment planning
[MPI-PAE/EXTRATERREST-132] N80-14621
IONOSPHERIC PROPAGATION
VLF/LF reflectivity of the polar ionosphere, 3 September - 30 December 1978
[AD-A074475] N80-14317
Ground-based propagation measurements in support of flight evaluation of the E-3A OMEGA navigation system, June - November 1976
[AD-A074476] N80-14321
IONOSPHERIC SOUNDING
Polar ionosphere
N80-14611
IONS
Radicals, reservoirs, and ions — important to stratospheric ozone photochemistry
N80-14645
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909
IRON
Microstructural investigation of polycrystalline iron whiskers
[AD-A074708] N80-14198
Development of the steam-iron process for hydrogen production, 9010
[FE-2435-32] N80-14258
IRON ALLOYS
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4693] N80-14200
The role of phosphorus in the intergranular embrittlement of Fe-3Si
N80-14230
IRON COMPOUNDS
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513

Review of industrial participation on the ANL lithium/iron sulfide battery development program — for energy storage and electric vehicles
[CONF-780853-1] N80-14573
IRRADIATION
Method for analyzing radiation sensitivity of integrated circuits
[NASA-CASE-NPO-14350-1] N80-14332
IRRIGATION
Groundwater resources of the Texas high plains: State-of-the-art and future research needs
[PB-298147/0] N80-14469
ISOMERIZATION
Photosensitization mechanisms for energy storing isomerizations
[AD-A074968] N80-14502
ITALY
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Problems related to the design and construction of a radar network
N80-14066
Organization of an integrated global maintenance service — Radar Networks
N80-14069
Experimental campaign for the analysis of dynamic clutter: The data acquisition system
N80-14078
Experimental campaign for the analysis of dynamic clutter: Processing of recorded data
N80-14079
Research on circular waveguide communication systems
[FUB-28] N80-14291
Italian research on millimetric waveguide systems
N80-14292

J

JET AIRCRAFT NOISE
Quiet Clean Short-Haul Experimental Engine [QCSEE] acoustic and aerodynamic tests on a scale model over-the-wing thrust reverser and forward thrust nozzle
[NASA-CR-135254] N80-14115
Acoustic considerations of flight effects on jet noise suppressor nozzles
[NASA-TM-81377] N80-14843
USAF bioenvironmental noise data handbook. Volume 125: F-105D aircraft, near and far-field noise
[AD-A073616] N80-14848
USAF bioenvironmental noise data handbook. Volume 129: F-100 aircraft in the AF32A-16 noise suppressor, near and far-field noise
[AD-A073793] N80-14849
USAF bioenvironmental noise data handbook. Volume 137: F-101B aircraft, near and far-field noise
[AD-A073617] N80-14850
USAF bioenvironmental noise data handbook. Volume 138: F-102A aircraft, near and far-field noise
[AD-A073618] N80-14851
Propagation from moving sources in flows — jet aircraft noise
N80-14869
JET ENGINE FUELS
Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256
JET EXHAUST
The kinetics and spectroscopy of aircraft and rocket plume constituents
[AD-A074208] N80-14222
JET FLOW
Stability of a flat wall jet
[REPT-79-5] N80-14370
Propagation from moving sources in flows — jet aircraft noise
N80-14869
JOINTS [JUNCTIONS]
Measurement of resistive torques in major human joints
[AD-A071170] N80-14695
JUDGMENTS
Validation and error in multiplicative utility functions
[AD-A073362] N80-14698
Importance weight assessment for additive, riskless preference functions: A review
[AD-A073365] N80-14700
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702
JUPITER [PLANET]
News conference on Voyager-2-Jupiter encounter [NASA-TM-80854] N80-15008
JUPITER PROJECT
News conference on Voyager-2-Jupiter encounter [NASA-TM-80854] N80-15008

K

KALMAN FILTERS
Kalmen filter processing of position and Doppler radar measurement in coupled Cartesian coordinates
[REPT-274] N80-14459
KEROSENE
Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256
KETONES
Syntheses and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14246
KINEMATICS
Optimal steering of a random motion of a point mass
[CSIR-TWISK-71] N80-14812
KLYSTRONS
Evaluation of the VA-878P klystron for the 20-kW X-band uplink transmitter
N80-14157

L

LABORATORY EQUIPMENT
Performance evaluation of the Horiba Instruments, Incorporated model U-7 water quality checker
[PB-298815/2] N80-14382
LAGRANGE MULTIPLIERS
Indicating cones and the intersection principle for tangential constraints in abstract multiplier rules
[CSIR-TWISK-68] N80-14810
LAKE SUPERIOR
Studies with a small seismic array in eastcentral Minnesota
N80-14604
LAMINAR BOUNDARY LAYER
Study of the formation of laminar flow separation induced by the deflection of a control surface — during hypersonic wind tunnel tests
[REPT-79-2] N80-14060
LAMINATES
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159166] N80-14197
LAND MANAGEMENT
The agro-ecological zones project — agroclimatic and land suitability assessment for various crops
N80-14445
LAND USE
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York
N80-14424
Implementation of state solar incentives: Land-use planning to ensure solar access
[SERI/TR-51-163] N80-14519
LANDSAT SATELLITES
The Earthnet programme — for the acquisition and distribution of LANDSAT satellite data
N80-14444
LARGE APERTURE SEISMIC ARRAY
Seismic discrimination — between earthquakes and underground nuclear explosions
[AD-A073772] N80-14614
Operation of a telemetered seismic network on the Alaska Peninsula
[DOE/ER-70006-6] N80-14619
LARGE SCALE INTEGRATION
A computer-aided design system for custom large-scale integrated circuits
N80-14158
LASER ANEMOMETERS
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323] N80-14050
Efficient laser anemometer for intra-rotor flow mapping in turbomachinery
[NASA-TM-79320] N80-14375
LASER APPLICATIONS
Laser-optical blade tip clearance measurement system
[NASA-TM-81376] N80-14128
Laser fluorescence studies of chemiluminescent chemical reactions
[AD-A073829] N80-14213
Surface hardening by laser skin melting
[AD-A074166] N80-14236
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392
The cost effectiveness of airborne laser hydrography
[PB-299057/0] N80-14668
Laser time-resolved site selections spectroscopy of Nd3+ ions in mixed garnet crystals
N80-14938
LASER CAVITIES
Laser apparatus
[NASA-CASE-GSC-12237-1] N80-14384
LASER DOPPLER VELOCIMETERS
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels — for gas velocity measurement
[AD-A074244] N80-14145
Efficient laser anemometer for intra-rotor flow mapping in turbomachinery
[NASA-TM-79320] N80-14375
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation
[AD-A073859] N80-14388
LASER OUTPUTS
A new class of optical communication systems. 1: Experiment
[AD-A074313] N80-14316
A cesium TELEC experiment at Lewis Research Center
[NASA-CR-159729] N80-14386
Laser power meter intercomparison test evaluated by two variable linear regression analysis
[AD-A074526] N80-14389
An algebraic model of adaptive optics for continuous-wave thermal blooming
[AD-A074741] N80-14906
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11425] N80-14908
LASER PLASMAS
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909
Behaviour of laser-produced plasma in a uniform magnetic field: Plasma instabilities
[IPPJ-424] N80-14919
LASER PUMPING
Laser apparatus
[NASA-CASE-GSC-12237-1] N80-14384
LASER WINDOWS
Infrared laser window coating by plasma polymerization
[AD-A075008] N80-14393
LASERS
Measured performance of laser intensity subcarrier direct detection optical communication receivers
N80-14383
Operating scenario for a Hydrographic Airborne Laser Sounder [HALS]
[AD-A073872] N80-14390
LATCHES
Low temperature latching solenoid — cryogenic fluid storage and flow control
[NASA-CASE-MSC-18106-1] N80-14338
LATTICES [MATHEMATICS]
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162530] N80-14052
LAW [JURISPRUDENCE]
Fire-code inspections and fire prevention: What methods lead to success
[PB-298991/1] N80-14276
Energy Policy and Conservation Act [Public Law 94-163] as amended by the National Energy Conservation Policy Act [Public Law 95-619]. Title 10: Energy. Chapter 2: Department of Energy. Subchapter D: Energy Conservation. Part 430: Energy conservation program for consumer products
[DOE/CS-0056] N80-14567
LEAD OXIDES
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220
LEAD SULFIDES
Influence of stoichiometry on impingement erosion of lead sulfide and zinc selenide
[AD-A073955] N80-14946
LEADING EDGES
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162530] N80-14052
LEARNING
Role learning and systematic instruction in pilot training
[AD-A068906] N80-14709
LIAPUNOV FUNCTIONS
Two-target pursuit-evasion differential games in the plane — liapunov techniques
[CSIR-TWISK-74] N80-14830
LIBRARIES
Assessment of the applicability of the national fire weather data library to wind energy analyses
[PNL-2538] N80-14655
LIFE [DURABILITY]
Development of an accelerated test design for predicting the service life of the solar array at Mead, Nebraska
[NASA-CR-162534] N80-14483
LIFE SUPPORT SYSTEMS
Aeronautical systems technology needs: Escape, rescue and survival
[AD-A074906] N80-14061
Anthropometric sizing, fit-testing and evaluation of the MBU-12/P oral-nasal oxygen mask
[AD-A074723] N80-14692

Biological systems for human life support: Review of the research in the USSR
[NASA-TM-76018] N80-14717
US aircrew chemical defense ensembles
N80-14736
LIGHT EMISSION
Scalable standard optical sources in the VUV: Emission from electron impact on metals — tantalum and tungsten
[NASA-CR-162562] N80-14900
LIGHT MODULATION
Determination of the velocity-field characteristic of gallium arsenide from Franz-Keldysh electroabsorption
N80-14331
LIGHT SCATTERING
Hydrodynamic and electrostatic characterization of particles by light scattering
N80-14209
Measurement of the ion profile by stationary CO2 laser scattering from a hydrogen plasma
[IPF-78-5] N80-14926
Light scattering from an arc plasma with stationary CO2 laser and heterodyne detection
[IPF-78-8] N80-14928
LIGHT WATER
Outlook for nuclear fusion energy
[CONF-7811126-1] N80-14509
LIGHT WATER BREEDER REACTORS
Evaluation of potential chemical/mechanical degradation processes affecting fuel and structural materials under long-term water storage
[NUREG-CR-0668] N80-14223
LIMITS [MATHEMATICS]
Limits and adjoint situations in mathematical structures
[CSIR-TWISK-67] N80-14809
LINE OF SIGHT COMMUNICATION
Linear modulation techniques for digital microwave
[AD-A074047] N80-14323
LINE SHAPE
OVPREC: A program automatic recognition of overlapping zones of broadened cartographic line elements
N80-14432
Some double resonance and multiple quantum NMR studies in solids — quantum mechanics study of nuclear magnetic resonance on line shape and spin resonance of solids
[LBL-8042] N80-14883
LINE SPECTRA
Post collision interaction in photoexcited argon LMM Auger processes
[IPPJ-422] N80-14912
LINEAR ARRAYS
Synthesis of linear array radiation patterns
N80-14090
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines
[ONERA-RTS-1/3127-EY] N80-14195
Two FORTRAN programs for the computation of the mean beam pattern of a perturbed array
N80-14780
LINEAR SYSTEMS
Linear systems analysis program, L224[QR]. Volume 1: Engineering and usage
[NASA-CR-2861] N80-14137
FORTRAN subroutines for out-of-core solutions of large complex linear systems
[NASA-CR-159142] N80-14773
LINEARIZATION
An algorithm for the linearization of raster images for minicomputers
N80-14439
LIQUEFIED NATURAL GAS
Liquefied gaseous fuels safety and environmental control assessment program
[DOE/EV-0036] N80-14266
LIQUID AMMONIA
Liquefied gaseous fuels safety and environmental control assessment program
[DOE/EV-0036] N80-14266
LIQUID HYDROGEN
Liquefied gaseous fuels safety and environmental control assessment program
[DOE/EV-0036] N80-14266
Microcomputer-based monitoring and control system
[SLAC-TN-79-3] N80-14798
LIQUID METALS
Measurement of sound velocity in liquid metals
[UCID-18171] N80-14857
LIQUID PROPELLANT ROCKET ENGINES
Performance of a transpiration-regenerative cooled rocket thrust chamber
[NASA-CR-159742] N80-14189
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2
[AD-A073671] N80-14194
LIQUID ROCKET PROPELLANTS
Supercharged topping rocket propellant feed system
[NASA-CASE-XLE-02062-1] N80-14188
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code
[AD-A074914] N80-14193
LIQUID-SOLID INTERFACES
Viscous film flows with contact lines: Finite element simulation, a basis for stability assessment and design optimization
N80-14351
LIQUID-VAPOR INTERFACES
Methods for calculation of engineering parameters for gas separation — vapor pressure and solubility of gases in organic liquids
[NASA-CR-162523] N80-14211
LIQUIDS
Hydraulic jumps in a partially filled rotating cylinder
[K/TS-2936] N80-14362
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector
[NASA-CR-161253] N80-14697
LITHIUM
Lithium inorganic electrolyte battery development
[AD-A073856] N80-14505
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420] N80-14920
LITHIUM ALLOYS
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
LITHIUM SULFUR BATTERIES
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
Lithium/metal sulfide battery development
[CONF-790538-10] N80-14530
Review of industrial participation on the ANL lithium/iron sulfide battery development program — for energy storage and electric vehicles
[CONF-780852-1] N80-14573
LITHOLOGY
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559] N80-15013
LOGARITHMIC RECEIVERS
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14303
LOGIC
A mind/brain/matter model consistent with quantum physics and UFO phenomena
[AD-A068985] N80-14711
LOGIC DESIGN
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
A computer-aided design system for custom large-scale integrated circuits
N80-14158
Analysis of logical ripple effect of program modification
N80-14769
LOGISTICS
US ROLAND 2 Logistics Model [ROLOG]: User's guide
[AD-A074449] N80-14960
LONG TERM EFFECTS
Evaluation of potential chemical/mechanical degradation processes affecting fuel and structural materials under long-term water storage
[NUREG-CR-0668] N80-14223
LONGITUDINAL STABILITY
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability — F-16
[NASA-TP-1538] N80-14136
LOOPS
Stability of the multimegabit telemetry carrier loop
N80-14155
LORENTZ FORCE
Effect of velocity overshoot on the performance of magnetohydrodynamic subsonic diffusers
[NASA-TM-79305] N80-14922
LOSSLESS MATERIALS
High frequency scattering from a thin lossless dielectric slab
[NASA-CR-162564] N80-14290
LOW FREQUENCIES
Ground-wave propagation in a realistic terrain
[BBC-RD-1979/19] N80-14286
LOW MOLECULAR WEIGHTS
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
LOW TEMPERATURE ENVIRONMENTS
Low temperature latching solenoid — cryogenic fluid storage and flow control
[NASA-CASE-MSC-18106-1] N80-14338
Low temperature lubrication
[STC-78/376] N80-14404
LOW TEMPERATURE PHYSICS
Materials studies for magnetic fusion energy applications at low temperatures-II
[PB-299288/1] N80-14244
LUBRICATING OILS
A study of the influence of oil saturation on the 64 meter antenna hydrostatic bearing grout
N80-14159
LUBRICATION SYSTEMS
Low temperature lubrication
[STC-78/376] N80-14404
LUGS
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U] N80-14413
LUMINOUS INTENSITY
X-ray variability observed with HEAO A-1
N80-14978
LUNAR CORE
Regolith layering processes based on studies of low-temperature volatile elements in Apollo core samples
[CONF-790381-1] N80-15016
LUNAR LANDING
Anniversary of Apollo 11 moon landing press conference
[NASA-TM-80844] N80-14148
Tenth anniversary of Apollo 11 moon landing
[NASA-TM-80473] N80-14149
LUNAR ROCKS
X-ray diffraction studies of shocked lunar analogs
[NASA-CR-162555] N80-15011
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559] N80-15013
Apollo 12 feldspathic basalts 12031, 12038, and 12072: petrology, comparison
[LA-UR-79-1117] N80-15014
Petrology of the Apollo 12 pigeonite basalt suite
[LA-UR-79-1116] N80-15015
LUNAR SURFACE
Regolith layering processes based on studies of low-temperature volatile elements in Apollo core samples
[CONF-790381-1] N80-15016

M

MAGNET COILS
Low temperature latching solenoid — cryogenic fluid storage and flow control
[NASA-CASE-MSC-18106-1] N80-14338
MAGNETIC FIELD CONFIGURATIONS
Anomalous electron thermal conductivity across destroyed magnetic surfaces
[PR-501] N80-14929
MAGNETIC FIELDS
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system
[NASA-TM-80179] N80-14771
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
Behaviour of laser-produced plasma in a uniform magnetic field: Plasma instabilities
[IPPJ-424] N80-14919
MAGNETIC MIRRORS
Stability of high density plasma in a multiple mirror
[IPPJ-418] N80-14914
MAGNETIC PERMEABILITY
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility
N80-14930
MAGNETIC SPECTROSCOPY
High resolution magnetic spectrometer for antiproton physics at rest and low energies
[BNL-24662] N80-14890
MAGNETIC STORMS
Real-time ISEE data system
[NASA-CR-162549] N80-14173
MAGNETIC SUSPENSION
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation
[NASA-TM-80136] N80-14163
MAGNETOHYDRODYNAMIC GENERATORS
Effect of velocity overshoot on the performance of magnetohydrodynamic subsonic diffusers
[NASA-TM-79305] N80-14922
MAGNETOHYDRODYNAMIC STABILITY
Ion heating by the current-driven turbulence in an inhomogeneous plasma
[IPPJ-423] N80-14911
Stability of high density plasma in a multiple mirror
[IPPJ-418] N80-14914
Behaviour of laser-produced plasma in a uniform magnetic field: Plasma instabilities
[IPPJ-424] N80-14919
Anomalous electron thermal conductivity across destroyed magnetic surfaces
[PR-501] N80-14929
MAGNETOHYDRODYNAMIC WAVES
Non-axial-symmetric Alfven waves in cylindrical, radial inhomogeneous plasmas
[IPF-78-6] N80-14927
MAGNETOHYDRODYNAMICS
Soft X-ray measurements for investigating plasma focus dynamics
[IPF-78-1] N80-14925
MAGNETOSPHERE
The current status of predictions of low energy plasma interactions with space systems — plasma interactions with spacecraft in orbit due to space charge and magnetosphere
[AD-A074523] N80-14186

Polar ionosphere
N80-14611

MAGNUS EFFECT
Magnus effect on spinning bodies of revolution
N80-14044

MAGSAT-A SATELLITE
Press briefing: MAGSAT — conferences
[NASA-TM-80757]
N80-14168

MAINTENANCE
Organization of an integrated global maintenance service — Radar Networks
N80-14040

MALES
A consideration of factors contributing to strength differences in men and women
[AD-A072871]
N80-14894

MAN ENVIRONMENT INTERACTIONS
Interrelationships between man, energy, and water quality: A new methodology for integrative analysis
[BNL-26188]
N80-14586
The stratosphere: Present and future
[NASA-RP-1049]
N80-14641
Long period changes in stratospheric parameters
N80-14647
Model predictions — for ozone concentration changes in the atmosphere
N80-14648

MAN MACHINE SYSTEMS
Vocabulary specification for automatic speech recognition in aircraft cockpits
[AD-A073703]
N80-14303
Sleep and body rhythm disturbance in long-range aviation. The problem and a search for relief
N80-14714
Technologies for the handicapped and the aged
[NASA-TM-80842]
N80-14715
Time simulation of an air surveillance task with varying amounts of radar information
[AD-A074956]
N80-14722
Some insights relative to the man-machine system: An overview of ten years of research
N80-14745

MANAGEMENT ANALYSIS
Management analysis of Key Resource Operations [MAKRO]. Volume 2, Appendix E: Networks. Annexes 1 and 2: Planning and programming
[AD-A069017]
N80-14958
Management Analysis of Key Resource Operations [MAKRO]. Volume 3, Appendix E: Networks. Annex 3: Budget formulation
[AD-A069018]
N80-14959
MANAGEMENT INFORMATION SYSTEMS
The air quality data handling system user's guide
[PB-290996/0]
N80-14592
Baseline software data system. Volume 1: System description
[AD-A073359]
N80-14761
US ROLAND 2 Logistics Model [ROLOG]: User's guide
[AD-A074449]
N80-14960
Assessment of technology for information services planning
[AD-A073315]
N80-14963
Spatial data management system
[AD-A068863]
N80-14964
The IMS Data Storage Hierarchy: DSH-1
[AD-A073375]
N80-14965
MANAGEMENT METHODS
Implementation of state solar incentives: A preliminary assessment
[SERI/TR-51-139]
N80-14520
Optimal selection from a random sequence with observation errors — for the assessment of mineral rights or industrial equipment options
[CSIR-TWISK-69]
N80-14829
Management Analysis of Key Resource Operations [MAKRO]. volume I
[AD-A069016]
N80-14957
MANAGEMENT PLANNING
Management Analysis of Key Resource Operations [MAKRO]. volume I
[AD-A069016]
N80-14957
Management analysis of Key Resource Operations [MAKRO]. Volume 2, Appendix E: Networks. Annexes 1 and 2: Planning and programming
[AD-A069017]
N80-14958
Management Analysis of Key Resource Operations [MAKRO]. Volume 3, Appendix E: Networks. Annex 3: Budget formulation
[AD-A069018]
N80-14959
Assessment of technology for information services planning
[AD-A073315]
N80-14963
MANGANESE COMPOUNDS
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining steels
N80-14231

MANGANIN [TRADEMARK]
Low impedance manganin stress gage system for severe shock wave environments
[UCRL-81605]
N80-14379

MANNED SPACE FLIGHT
Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
[ESA-BR-01]
N80-14677

MANUAL CONTROL
Pilot control through the TAFCOS automatic flight control system
[NASA-TM-81152]
N80-14138

MANUFACTURING
Annual summary of technical awareness in the nonferrous metals industry
[PB-299285/7]
N80-14967

MANY BODY PROBLEM
The electron-phonon interaction spectrum in proximity effect copper
N80-14937

MAPPING
Information on cartography and geodesy. Series 1: Original report number 73
N80-14427
Quantification of syntactic information content in graphics used for social empirical research
N80-14428
Graphical processing of areal related data. Program development done in Nordrhein-Westfalen
N80-14429
Program controlled cartographic generalization of buildings, for 1:25000 topographic maps
N80-14430
An interactive editor for cartographic data
N80-14431
OVPREC: A program automatic recognition of overlapping zones of broadened cartographic line elements
N80-14432
Cartographic automation status in a German hydrographic institute
N80-14433
Establishment of a data base of the administrative boundaries of Germany, scale 1:500,000 to 1:1,000,000
N80-14434
Generalization algorithms
N80-14435
Three types of geographic data structure: Similitudes, differences, and possible synthesis
N80-14436
A program for the design of geographical maps
N80-14438
An algorithm for the linearization of raster images for minicomputers
N80-14439

MAPS
SCANLINE: A computer program for converting raster maps into line maps
[CSIR-TWISK-43]
N80-14426

MARINE BIOLOGY
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-A: Compendium of work element reports
[PB-299686/6]
N80-14588
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1977/1978. Volume 2-B: Compendium of work element reports
[PB-299687/4]
N80-14589
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977.
[CNEXO-16-1978]
N80-14667
Underwater sound scattering by marine organisms. A review — sonar interference
[MRL-R-756]
N80-14841

MARINE METEOROLOGY
Compendium of meteorology for use by class one and class two meteorological personnel. Volume 2, part 3: Marine meteorology
[WMO-364]
N80-14680

MARKET RESEARCH
Application of diffusion research to solar energy policy issues
[SERI/TR-51-194]
N80-14518
Commercialization strategy report for energy from urban wastes
[TID-28852-DRAFT]
N80-14521
Commercialization strategy report for large wind systems
[TID-28843-DRAFT]
N80-14544
Photovoltaic power systems market identification and analysis
[PCP/T4022-01]
N80-14559

MARKETING
Silicon materials outlook study for 1980-1985 calendar years
[NASA-CR-162541]
N80-14692
Commercialization strategy report for small wind systems
[TID-28844-DRAFT]
N80-14543
Commercialization strategy report for solar water heating
[TID-28856-DRAFT]
N80-14545
Commercializing solar heating: A national strategy needed
[PB-297812/3]
N80-14575
Commercialization strategy report for electric and hybrid vehicles
[TID-28850-DRAFT]
N80-14972

MARKOV CHAINS
A simple procedure for simulation of homogeneous Markhov chains on a computer
[ESA-TT-529]
N80-14787

MARS ATMOSPHERE
Structure of the Mars lower and middle atmosphere based on Mars 5 ultraviolet photometry data
[PR-483]
N80-15018

MARS SURFACE
Preliminary results of penetrator field test program, Tonopah, Nevada, 16-28 April 1979
[NASA-TM-58222]
N80-15012

MARS 5 SPACECRAFT
Structure of the Mars lower and middle atmosphere based on Mars 5 ultraviolet photometry data
[PR-483]
N80-15018

MASERS
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency
[NASA-CR-162525]
N80-14878

MASS FLOW
Design and performance of the drag-disc turbine transducer
[CONF-790605-2]
N80-14347
Mass flow rate measurements in two-phase mixtures with stagnation probes
[CONF-790655-1]
N80-14363

MASS SPECTROMETERS
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909

MASS SPECTROSCOPY
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728]
N80-14227
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A074963]
N80-14262

MASS TRANSFER
Diffusional mass transport in polycrystals containing stationary or migrating grain boundaries
[COO-5002-1]
N80-14949

MATERIALS HANDLING
Development of mullite substrates and containers
[NASA-CR-162543]
N80-14485

MATERIALS RECOVERY
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790377-1]
N80-14562

MATHEMATICAL MODELS
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208]
N80-14048
Avionics installation [AVSTALL] cost model for user equipment of NAVSTAR global positioning system
[AD-A073681]
N80-14106
Application of the multistage axial-flow compressor time-dependent mathematical modeling technique to the TF41-A-1 modified block 76 compressor
[AD-A074478]
N80-14134
Complete stress-strain curve of concrete and nonlinear design
[PB-299151/1]
N80-14277
A model for space radar clutter
[AD-A072990]
N80-14302
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part B
[NASA-CR-160355]
N80-14329
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 2: User's guide to computer EMA model
[NASA-CR-160356]
N80-14340
A probabilistic study of wind-electric conversion systems from the point of view of reliability and capacity credit
N80-14475
Geothermal energy market study on the Atlantic coastal plain. Economic evaluation model for direct use of moderate temperature, up to 250 F, geothermal resources in the northern Atlantic coastal plain
[PB-298785/7]
N80-14578
Stochastic modeling of the time-averaged equations for climate dynamics
[NASA-CR-162527]
N80-14652
Wind field analyses of severe storms for COMPASS [Cooperative Observational and Modeling Project for the Analysis of Severe Storms]
[PB-300298/7]
N80-14661
Validation and error in multiplicative utility functions
[AD-A073362]
N80-14698
Process model of how the human operator tracks discontinuous inputs
[AD-A069001]
N80-14712
Quantitative military workload analysis
N80-14748
Investigation of security classifications for secure information flow
[REPT-275]
N80-14766
A model for the computational determination of parameter values of anthropomorphic segments
[CSIR-TWISK-79]
N80-14807
Analytic modeling of aerosol size distributions
[NASA-CR-159170]
N80-14815
A general solution to making inferences about the parameters of mixed linear models
N80-14826
Categorical data models for complex sampling schemes — contingency tables
N80-14827

Equilibrium and propagation of a rotating relativistic electron beam in the absence of an external guide field
[AD-A074803] N80-14834
Statistical mechanics and field theory
[LBL-9166] N80-14952
Possible radio emission mechanism for pulsars
[NASA-TM-75715] N80-15023

MATHEMATICAL PROGRAMMING
Global saddle-point theorems involving conjugate-like operators, for general and quasi-concave programs
[CSIR-TWISK-72] N80-14811

MATRICES (MATHEMATICS)
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown
[TR-41] N80-14804
Integrating matrices for arbitrarily spaced grid points
[NASA-CR-159172] N80-14816

MATRIX THEORY
Integrating matrices for arbitrarily spaced grid points
[NASA-CR-159172] N80-14816

MAXIMUM LIKELIHOOD ESTIMATES
A computer program for estimation of parameters of the Weibull intensity function and for the Cramer-Von Mises goodness of fit test
[AD-A074764] N80-14777
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown
[TR-41] N80-14804

MEASUREMENT
Measuring methods of the electromagnetic characteristics of circular waveguides
N80-14300
Quantification of syntactic information content in graphics used for social empirical research
N80-14428

MEASURING INSTRUMENTS
Displacement probes with self-contained exciting medium
[NASA-CASE-LAR-11690-1] N80-14371
The design of meteorological field experiments with applications to the mesoscale — sensor placement for severe storm sampling
N80-14629
Three instruments for assessment of WBGT and a comparison with WGT [BOTSBALL]
[AD-A074979] N80-14691

MECHANICAL DRIVES
Antenna deployment mechanism for use with a spacecraft — extensible and retractable telescopic antenna mast
[NASA-CASE-GSC-12331-1] N80-14183

MECHANICAL PROPERTIES
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14242
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52688] N80-14253
Characteristics of disc springs in combination [to be used in conjunction with item no. 78043]
[ESDU-79010] N80-14396

MECHANICAL SHOCK
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341

MELTING
Surface hardening by laser skin melting
[AD-A074166] N80-14236

MEMBRANES
Dialysis system — using ion exchange resin membranes permeable to urea molecules
[NASA-CASE-NPO-14101-1] N80-14687

MENTAL PERFORMANCE
Effect of peripherally presented visual signals on pilot performance during flight simulation
[AD-A073604] N80-14703

MERCURY [METAL]
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4
[CONF-780807-11] N80-14265

METAL COATINGS
Thermal aging characteristics of electrodeposited black chrome solar coatings
[SAND-78-2094C] N80-14527

METAL COMPOUNDS
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry
[AD-A074806] N80-14216

METAL CUTTING
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining-steels
N80-14231

METAL FATIGUE
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240

METAL FILMS
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220

METAL OXIDE SEMICONDUCTORS
Optoelectronic properties of metal-tunnel oxide-silicon junctions
N80-14336
Space Dosimetry. Volume 1: Project description
[FRI-R646/3-VOL-1] N80-14380
Recent investigations of metal oxide/CdTe heterojunction solar cells
[CONF-780619-25] N80-14564

METAL PLATES
Estimating structural integrity of Type 304 stainless steel plates and pipes containing small defects
[CONF-790802-11] N80-14238

METAL POWDER
Palladium sintering: Shrinkage kinetics for a sponge powder
[SAND-78-8207] N80-14241
Microwave magnetoplasma effects in semiconductor powers and arrays of spheres
N80-14933

METAL SPINNING
The improvement of refractory alloys through powder metallurgy involving sintering with spinning
[ONERA-RT-12/1931-MY] N80-14343

METAL SURFACES
Contact stress analysis of ceramic-to-metal interfaces — in gas turbine engines
[AD-A074491] N80-14417
Scalable standard optical sources in the VUV: Emissions from electron impact on metals — tantalum and tungsten
[NASA-CR-162562] N80-14900

METAL VAPORS
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206
Study of two-photon absorption and amplification processes in gases
[AD-A074951] N80-14391

METALLURGY
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14474-1] N80-14229

METALS
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility
N80-14930

METEOROID PROTECTION
Meteoroid protection methods for spacecraft radiators using heat pipes
[NASA-CR-162545] N80-14185

METEOROLOGICAL INSTRUMENTS
Current research on aviation weather [bibliography], 1979
[NASA-CR-3214] N80-14651

METEOROLOGICAL PARAMETERS
Overview of agrometeorology — influence of meteorological parameters on crop growth
N80-14441
Crop weather models: Concepts and applications
N80-14450
Aerometric data analysis for the Houston Area Oxidant Study, volume 2
[PB-299648/6] N80-14599
Aerometric data analysis for the Houston Area Oxidant Study. Volume 1: Executive summary
[PB-299647/8] N80-14600
A utilization of the nested grid approach in the development of a severe weather index
N80-14627
The design of meteorological field experiments with applications to the mesoscale — sensor placement for severe storm sampling
N80-14629
Meteorology for Solar Energy Applications — conferences
[ISSN-0306-7874] N80-14631
Meteorology of the stratosphere
N80-14646
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX
[GARP-SPEC-REPT-32] N80-14656

METEOROLOGICAL RADAR
Comparison between the first pluviometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite — to study rain structures affecting radio channels at millimetric wavelengths
N80-14089
Needed weather information where it belongs; in the cockpit
N80-14635
Atlanta Air Route Traffic Control Center's involvement in aviation weather
N80-14637

METEOROLOGICAL SATELLITES
Crop environment monitoring: The remote sensing systems
N80-14452
Methods and programs to utilize satellite indirect soundings in environmental analysis and prediction
[AD-A074772] N80-14654

METEOROLOGY
Atmospheric echo sounding. A bibliography with abstracts
[NTIS/PS-0989/8] N80-14626
Meteorology for Solar Energy Applications — conferences
[ISSN-0306-7874] N80-14631
Proceedings, Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems
[NASA-CP-2104] N80-14633
Meteorological input to general aviation pilot training
N80-14634
The stratosphere: Present and future
[NASA-RP-1049] N80-14641
National report: Meteorology for 1975-1979 — Czechoslovakian activities
N80-14649

METEOSAT SATELLITE
Meteosat and remote sensing application
N80-14448

METHANE
Fast production of methane by anaerobic digestion, volume 1 — solid waste utilization
[COO-2990-17-VOL-1] N80-14268
Biological conversion of biomass to methane
[COO-2917-12] N80-14270

METHODOLOGY
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop — methodology for structural design criteria for time temperature functions for creep rupture strength
[EPRI-FP-1062-VOL-1] N80-14235

METRIC SPACE
Strong shape theory
N80-14802
Results and conjectures on covering metric spaces
[CSIR-TWISK-70] N80-14833

METROLOGY
Laser power meter intercomparison test evaluated by two variable linear regression analysis
[AD-A074526] N80-14389

MICROBEAMS
An X-ray study of the region around static and fatigue cracks
N80-14411

MICROCOMPUTERS
Microcomputer-based on-line state estimation with applications to satellites
N80-14033
Analog and digital hardware development for a microcomputer controlled data acquisition system for acoustical imaging
[AD-A074446] N80-14763
Microcomputer-based monitoring and control system
[SLAC-TN-79-5] N80-14798

MICROELECTRONICS
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073655] N80-14342

MICROMETEOROIDS
Studies of interplanetary dust — study by satellite observation of interplanetary dust from micrometeoroids
N80-15006

MICROORGANISMS
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
Microbial colonization of materials at Innisfail, Queensland
[MRL-TN-423] N80-14670

MICROPARTICLES
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385

MICROPROCESSORS
Federated microcomputer systems for on-board missile guidance and control
N80-14040
The microprocessor-based synthesizer controller
N80-14162
Development and testing of the Junkosper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78244] N80-14495
Development and testing of the Rho Sigma Incorporated microprocessor control subsystem
[NASA-TM-78245] N80-14496
Development of a comparative analyzer for microprocessor
[BDX-613-2060-REV] N80-14765
A microprocessor-based random-dot stereogram system — for basic research and clinical testing
N80-14768

MICROSTRIP TRANSMISSION LINES
Resonant frequency of microstrip antennas calculated from TE-excitation of an infinite strip embedded in a grounded dielectric slab
[NASA-TM-80190] N80-14289

MICROSTRUCTURE
Microstructural investigation of polycrystalline iron whiskers
[AD-A074708] N80-14198
Substructure and properties of sodium beta alumina solid electrolytes
[EPRI-FP-1058] N80-14224

The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining steels
N80-14231
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240
MICROWAVE AMPLIFIERS
Linear modulation techniques for digital microwave
[AD-A074047] N80-14323
MICROWAVE ANTENNAS
Synthesis of linear array radiation patterns
N80-14080
MICROWAVE FREQUENCIES
Development trends of airport surface traffic control radar
N80-14087
MICROWAVE LANDING SYSTEMS
Digital array signal processing techniques applied to guidance and navigation
N80-14032
MICROWAVE OSCILLATORS
Phase-locking in power oscillators
N80-14085
MICROWAVE RADIOMETERS
Electromagnetic power absorber
[NASA-CASE-NPO-13830-1] N80-14281
MICROWAVE SCATTERING
The velocity of clusters of galaxies relative to the microwave background. The possibility of its measurement
[PR-488] N80-15007
MICROWAVES
Microwave magnetoplasma effects in semiconductor powers and arrays of spheres
N80-14933
MILITARY OPERATIONS
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL] N80-14728
Concerning individual equipment for fighter pilots in the Air Force
N80-14735
Quantitative military workload analysis
N80-14748
MILLIMETER WAVES
Comparison between the first pluviometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite — to study rain structures affecting radio channels at millimetric wavelengths
N80-14089
Research on circular waveguide communication systems
[FUB-28] N80-14291
Italian research on millimetric waveguide systems
N80-14292
General considerations about circular waveguide systems
N80-14293
MINICOMPUTERS
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
MINIMAX TECHNIQUE
On Bayes and gamma-minimax subset selection rules
N80-14823
MINING
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423
Annual summary of technical awareness in the nonferrous metals industry
[PB-299285/7] N80-14967
MINNESOTA
Studies with a small seismic array in eastcentral Minnesota
N80-14604
MIOSIS
The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment
N80-14731
MISSILE CONTROL
Federated microcomputer systems for on-board missile guidance and control
N80-14040
Application of discrete guidance and control theory
[AD-A074782] N80-14172
MISSILE STRUCTURES
Target missile airframe costs
[AD-A073314] N80-14112
MISSILE TRACKING
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability
[AD-A074947] N80-14171
MISSION PLANNING
Space transportation system shuttle turnabout analysis report
[NASA-TM-80840] N80-14177
Missions and planning for nuclear space power
[LA-UR-79-1240] N80-14893
MISSOURI
Urban-rural insolation correlation study — air pollution over metropolitan St. Louis
[DOE/ET-0092] N80-14618
MIXED CRYSTALS
Laser time-resolved site selectivous spectroscopy of Nd3+ ions in mixed garnet crystals
N80-14938
MIXING CIRCUITS
Antenna-coupled infrared detectors
[AD-A074085] N80-14320
MODELS
Dynamic energy system optimization model — study of computerized simulation domestic energy models
[EPRI-EA-1079] N80-14514
MODEMS
Linear modulation techniques for digital microwave
[AD-A074047] N80-14323
MOISTURE CONTENT
Relationships between ir extinction, absorption and liquid water content of fogs
[AD-A074395] N80-14653
MOLECULAR BEAMS
Photodissociation processes in molecular beams — excess
[LBL-9219] N80-14886
MOLECULAR COLLISIONS
Calculation of total cross sections for charge exchange in molecular collisions
[NASA-CR-162560] N80-14879
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880
Interaction of fast molecular ions with matter
[CONF-790524-8] N80-14889
MOLECULAR EXCITATION
Molecular reaction rates
[AD-A073851] N80-14882
MOLECULAR IONS
Interaction of fast molecular ions with matter
[CONF-790524-8] N80-14889
MOLECULAR RELAXATION
Absorption of sound waves in the atmosphere
N80-14867
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880
MOLECULAR ROTATION
The generalized phase shift approach to rotational excitation in dilute diatomic gases
N80-14202
MOLTEN SALT ELECTROLYTES
The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis
[AD-A073421] N80-14942
MOLYBDENUM
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14242
Investigation of molybdenum impurity diffusion during hydrogen gas puffing in JIPP T-II plasma
[IPPJ-412] N80-14915
MOLYBDENUM COMPOUNDS
Hydrogenation catalysts derived from Mo(CO)6/alumina
N80-14208
MOMENTS
Computation of moments of functionals of a solution to a stochastic differential equation
[CSIR-TWISK-73] N80-14813
MONOPULSE ANTENNAS
Digital signal processing techniques in a monopulse tracking radar
N80-14035
MONOPULSE RADAR
Monopulse receiver performance in SSR and DABS systems
N80-14093
Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
MONOTONE FUNCTIONS
Finding the root of a monotonic function
[CSIR-TWISK-75] N80-14806
MONSOONS
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX
[GARP-SPEC-REPT-32] N80-14656
Report of the Second Session of the WAMEX Scientific and Management Regional Committee
[GARP-SPEC-REPT-33] N80-14657
MONTANA
A statistical analysis of extreme chinooks in Montana as they relate to large scale circulation changes
N80-14630
MONTE CARLO METHOD
Contribution Monte Carlo — for calculating target response
[LA-7849-MS] N80-14817
An investigation of the power efficiency of the Friedman nonparametric anova test with respect to the one factor repeated measures anova F-test
N80-14825
MORPHOLOGY
A model for the computational determination of parameter values of anthroponomorphic segments
[CSIR-TWISK-79] N80-14807
MOTIVATION
A study in procedural manipulation of locus of control
[AD-A068658] N80-14704
Work performance as a function of the interaction of ability, work values, and the perceived work environment
[AD-A068893] N80-14707
MOTOR VEHICLES
Applications of fuel cells in transportation
[LA-UR-79-628] N80-14526
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Self-study guide
[PB-299256/8] N80-14723
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/6] N80-14724
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 1
[PB-299305/3] N80-14725
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 2
[PB-299306/1] N80-14726
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 3
[PB-299307/9] N80-14727
MOVING TARGET INDICATORS
Dynamic clutter reduction techniques with moving target indicated adaptive filters
N80-14080
MULLITES
Development of mullite substrates and containers
[NASA-CR-162543] N80-14485
MULTICHANNEL COMMUNICATION
A communication problem in a computer network
[REPT-272] N80-14793
MULTIMODE RESONATORS
Forward and backward stimulated Raman scattering in a multimode fiber
[CONF-780681-2] N80-14394
MULTIPATH TRANSMISSION
Identification of limit cycles in multinonlinearity, multiple path systems
N80-14333
MULTIPLE ACCESS
Capacity allocation techniques in a multi-user satellite system
[AD-A074018] N80-14310
Error control systems for multi-access communication channels
[AD-A074569] N80-14314
MULTIPLEXING
A new class of optical communication systems. 1: Experiment
[AD-A074313] N80-14316
MULTIPROCESSING [COMPUTERS]
A method for designing multiprocessor architectures for avionics functions
N80-14021
The Megaprocessor: A multiple-processor architecture based upon expression tree pipelining
N80-14759
MULTISPECTRAL BAND SCANNERS
Study and investigation of infrared multispectral target cueing techniques
[AD-A074799] N80-14458
MULTIVARIATE STATISTICAL ANALYSIS
Qualitative dependency among random variables, with applications in probability and statistics
N80-14822
MUONS
Capture of muons in atoms
[CALT-63-304] N80-14888
MUSCULAR STRENGTH
A consideration of factors contributing to strength differences in men and women
[AD-A072671] N80-14694
MUSCULOSKELETAL SYSTEM
A model for the computational determination of parameter values of anthroponomorphic segments
[CSIR-TWISK-79] N80-14807

N

NASA PROGRAMS
NASA broad-specification fuels combustion technology program: Status and description
[NASA-TM-79315] N80-14126
Status of the DOE/NASA critical gas turbine research and technology project
[NASA-TM-79307] N80-14493
A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments
[NASA-CR-162557] N80-14791

Functional design specification: NASA form 1510 [NASA-CR-162513] N80-14955
Press conference: FY 1980 budget [PB-301832] N80-14968
The NASA FY 1980 budget [PB-301833] N80-14969
A review of NASA international programs [NASA-TM-80845] N80-14971

NATURAL GAS
Energy from the West: Energy resource development systems report. Volume 5: Oil and natural gas [PB-299181/8] N80-14467

NATURAL LANGUAGE [COMPUTERS]
Knowledge-based parsing [AD-A069656] N80-14774

NAVIGATION AIDS
Evaluation of solar photovoltaic arrays for use on marine aids to navigation [AD-A074893] N80-14507

NAVY
Navy combat search and rescue [AD-A074593] N80-14062

NEAR INFRARED RADIATION
Development of charge transfer devices for 1-2 micron imaging [AD-A074653] N80-14903

NEBULAE
Columbia/Einstein observations of galactic X-ray sources [CONTRIB-179] N80-14999

NEGATIVE IONS
Formation of hydrogen negative ions by surface and volume processes with application to negative ion sources [UCRL-82889] N80-14887

NEODYMIUM
Laser time-resolved site selection spectroscopy of Nd3+ ions in mixed garnet crystals N80-14938

NEPHANALYSIS
Practical exercise on the analysis of visible and infrared images from NOAA-5 N80-14453

NERVOUS SYSTEM
Microsomphology of neurohypophysis of rats under experimental conditions [NASA-TM-75947] N80-14671
A model for the computational determination of parameter values of anthropomorphic segments [CSIR-TWISK-79] N80-14807

NETWORK ANALYSIS
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission N80-14030

NEUROGLIA
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization [NASA-TM-75983] N80-14672

NEUROMUSCULAR TRANSMISSION
The effects of acute and chronic low dose exposure to anticholinesterases N80-14729
Therapy on nerve agent poisoning N80-14732

NEUTRINOS
Topics in the QCD phenomenology of deep-inelastic scattering [SLAC-PUB-2296] N80-14950

NEUTRON SCATTERING
The use of resonance epithermal neutron scattering for the study of condensed matter N80-14936

NEUTRON STARS
The HEAO-1 neutron star timing experiment N80-14989

NEW MEXICO
Deep terrestrial heat flow measurements in New Mexico and neighboring geologic areas [PB-299489/3] N80-14471

NEW YORK
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York N80-14424
Barriers to the application of wind energy conversion systems in urban settings N80-14494

NICKEL
Photoemission studies of time-resolved surface reactions: Isothermal desorption of CO from Ni(3) [AD-A074953] N80-14221
A study of surface zone deterioration of nickel leading to fatigue crack initiation in low cycle fatigue N80-14412

NIOBIUM ALLOYS
Heat capacity of amorphous and disordered Nb3Ge thin films N80-14931

NITRAMINE PROPELLANTS
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives [AD-A074963] N80-14262

NITRATES
Sulfate and nitrate collected by filter sampling near the tropopause [NASA-TP-1567] N80-14581

NITROGEN
Thermodynamic properties of nitrogen gas derived from measurements of sound speed — for cryogenic wind tunnels [NASA-RP-1051] N80-14257

NITROGEN HYDRIDES
IR optical properties of thin H2O, NH3, and CO2 cryofilms [AD-A074913] N80-14944

NITROGEN ISOTOPES
Ultraviolet spectroscopy of nitrous oxide [N2O]: A temperature-resolved study [LBL-8739] N80-14225

NITROUS OXIDES
Laser fluorescene studies of chemiluminescent chemical reactions [AD-A073829] N80-14213
Ultraviolet spectroscopy of nitrous oxide [N2O]: A temperature-resolved study [LBL-8739] N80-14225

NOAA 5 SATELLITE
Practical exercise on the analysis of visible and infrared images from NOAA-5 N80-14453

NOISE [SOUND]
Derivation of presbycusis and Noise Induced Permanent Threshold Shift [NIPTS] to be used for the basis of a standard on the effects of noise on hearing [AD-A071310] N80-14690

NOISE GENERATORS
Special Course on Acoustic Wave Propagation [AGARD-R-686] N80-14858
Directivity of acoustic radiation from sources N80-14863
Experimental measurements of moving noise sources N80-14868

NOISE REDUCTION
Acoustically swept rotor — helicopter noise reduction [NASA-CASE-ARC-11106-1] N80-14397
Quiet short-haul research aircraft familiarization document — STOL [NASA-TM-81149] N80-14308
Restoration and enhancement of images observed in multiplicative noise N80-14770
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations — conducted in the Langley V/STOL tunnel [NASA-TP-1608] N80-14840
Acoustic considerations of flight effects on jet noise suppressor nozzles [NASA-TM-81377] N80-14843

NOISE SPECTRA
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results [ESA-CR[P]-1228-VOL-1] N80-14784

NONADIABATIC CONDITIONS
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation [IPPJ-32] N80-14917

NONAQUEOUS ELECTROLYTES
Substructure and properties of sodium beta alumina solid electrolytes [EPRI-FP-1056] N80-14224
Solid electrolyte fuel cell for electric power generation — nonaqueous electrolyte fuel cells development for electric power plants [BNL-26236] N80-14522

NONDESTRUCTIVE TESTS
Ultrasonic flaw detection and characterization in structural materials by spectral analysis [ORNL/TM-6456] N80-14408
Vibration analysis and nondestructive testing using double-exposure holographic techniques [AD-A073457] N80-14415
Fracture strength of silicon solar cells [NASA-CR-162540] N80-14490

NONEQUILIBRIUM CONDITIONS
Kinematic analysis of osmotic processes under non-equilibrium conditions N80-14669

NONFERROUS METALS
Annual summary of technical awareness in the non-ferrous metals industry [PB-299285/7] N80-14967

NONLINEAR EQUATIONS
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions [IPPJ-417] N80-14910

NONLINEAR PROGRAMMING
Contributions to constrained optimization — nonlinear programming N80-14801

NONLINEAR SYSTEMS
Identification of limit cycles in multinonlinearity, multiple path systems N80-14333
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description [ESA-CR[P]-678-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description [ESA-CR[P]-678-VOL-3] N80-14783
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results [ESA-CR[P]-1228-VOL-1] N80-14784
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description [ESA-CR[P]-1228-VOL-2] N80-14785
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques [ESA-CR[P]-1228-VOL-3] N80-14786

NONLINEARITY
Finite-amplitude wave propagation — acoustic propagation in nonlinear media N80-14874
Nonlinear interaction of finite-amplitude sound waves N80-14875
Nonlinear shift of resonance velocity in interactions between particles and plasma cyclotron waves [IPPJ-421] N80-14916

NONUNIFORM PLASMAS
Ion heating by the current-driven turbulence in an inhomogeneous plasma [IPPJ-425] N80-14911
Enhancement of D-T reaction rate due to D-T contact [IPPJ-419] N80-14913

NORTH AMERICA
Proceedings of Second International Symposium on Problems Related to the Redefinition of North American Geodetic Networks — conferences [PB-299260/0] N80-14623
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan [WMO-524] N80-14658

NORTH SEA
Gravimetric vertical deflection determination for the North Sea regions [GVDNS 1] — study of free atmosphere gravity anomalies [SER-B-235] N80-14622

NOTCH TESTS
An X-ray study of the region around static and fatigue cracks N80-14411

NOZZLE GEOMETRY
Static test-stand performance of the TF-302 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA] [NASA-TP-1556] N80-14121

NUCLEAR ELECTRIC POWER GENERATION
Nuclear power program information and data: Update, March - April 1979 [DOE/TIC-10119] N80-14894

NUCLEAR ELECTRIC PROPULSION
Missions and planning for nuclear space power [LA-UR-79-1240] N80-14893

NUCLEAR EXPLOSION EFFECT
Protective coatings for aircraft composites in nuclear environments [AD-A074889] N80-14199

NUCLEAR EXPLOSIONS
Seismic discrimination — between earthquakes and underground nuclear explosions [AD-A073772] N80-14614

NUCLEAR FISSION
Outlook for nuclear fusion energy [CONF-7811126-1] N80-14509

NUCLEAR FUEL REPROCESSING
Liquid weighing by buoyancy technique [GEFR-SP-158] N80-14836
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles, volume I [PB-299105/7] N80-14974
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles. Volume 2: Appendices [PB-299106/5] N80-14975

NUCLEAR FUELS
Evaluation of fuel resources and requirements for the magnetic fusion energy program [MLM-2419] N80-14570
Nuclear power program information and data: Update, March - April 1979 [DOE/TIC-10119] N80-14894

NUCLEAR FUSION
Materials studies for magnetic fusion energy applications at low temperatures-II [PB-299288/1] N80-14244
Evaluation of fuel resources and requirements for the magnetic fusion energy program [MLM-2419] N80-14570

NUCLEAR MAGNETIC RESONANCE
Some double resonance and multiple quantum NMR studies in solids — quantum mechanics study of nuclear magnetic resonance on line shape and spin resonance of solids [LBL-8042] N80-14883

NUCLEAR PHYSICS
High resolution magnetic spectrometer for antiproton physics at rest and low energies [BNL-24662] N80-14990

NUCLEAR POWER PLANTS
Nuclear power program information and data: Update, March - April 1979 [DOE/TIC-10119] N80-14894

NUCLEAR REACTORS
Estimating structural integrity of Type 304 stainless steel plates and pipes containing small defects
[CONF-790802-13] N80-14238
NUCLEAR RESEARCH
Superconducting magnets in high energy physics
[BNL-24818] N80-14697
NUCLEATION
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4681] N80-14200
NUCLEONS
Pion nucleon interaction at low energy
[DOE-5126-60] N80-14895
NUMERICAL ANALYSIS
Numerical solution of the electric and magnetic field integral equations
[ESA-TT-597] N80-14821
An investigation of the power efficiency of the Pitzdiam nonparametric moves test with respect to the one factor repeated measures moves F-test
N80-14825
NUMERICAL CONTROL
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
Microcomputer-based monitoring and control system
[SLAC-TN-79-3] N80-14798
NUMERICAL INTEGRATION
Automated numerical integration over a triangle
[CSIR-TWISK-70] N80-14805
Approximate and exact numerical integration of the gas dynamic equations
[NASA-CR-162554] N80-14834
Integrating matrices for arbitrarily spaced grid points
[NASA-CR-159172] N80-14836
NUMERICAL WEATHER FORECASTING
A utilization of the nested grid approach in the development of a severe weather index
N80-14627

O

O RING SEALS
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52669] N80-14253
OBLIQUE SHOCK WAVES
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
OCEAN BOTTOM
The implication of Px amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14406
Toward improved techniques for predicting soil strength in offshore environments
[PB-299980/2] N80-14625
OCEAN CURRENTS
Langmuir circulations as a convective instability mechanism and its effect on the ocean mixed layer
N80-14662
Acoustic implications of mesoscale oceanographic phenomena — study of effect of ocean currents on acoustic propagation using an ocean model for underwater acoustics
[AD-A074456] N80-14835
OCEAN DATA ACQUISITIONS SYSTEMS
Arctic Research in Environmental Acoustics [AREA]. Technical report no. 9: Arctic lead-airdrop data buoy
[AD-A074731] N80-14664
Airborne Expendable Bathythermograph [AXBT] observations immediately before and after passage of typhoon PHYLLIS in August of 1975
[AD-A074809] N80-14666
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977.
[CNEXO-16-1978] N80-14667
OCEAN MODELS
Acoustic implications of mesoscale oceanographic phenomena — study of effect of ocean currents on acoustic propagation using an ocean model for underwater acoustics
[AD-A074456] N80-14835
OCEAN SURFACE
Langmuir circulations as a convective instability mechanism and its effect on the ocean mixed layer
N80-14662
A study of the relationship between oceanic chemical mesoscale and sea surface thermal structure as detected by satellite infrared imagery
[AD-A074186] N80-14663
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
OCEAN THERMAL ENERGY CONVERSION
Fifth Ocean Thermal Energy Conversion Conference, volume 2, sections 4-5
[CONF-790236-P2] N80-14553
Fifth Ocean Thermal Energy Conversion Conference, volume 3, sections 6-7
[CONF-790236-P3] N80-14554
Fifth Ocean Thermal Energy Conversion Conference, volume 1, sections 1-3
[CONF-790236-P1] N80-14555
OTEC-1 test conductor program — project management quality control
[CONF-780550-9] N80-14563
OCEANOGRAPHIC PARAMETERS
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
Airborne Expendable Bathythermograph [AXBT] observations immediately before and after passage of typhoon PHYLLIS in August of 1975
[AD-A074809] N80-14666
OCEANOGRAPHY
Compendium of meteorology for use by class one and class two meteorological personnel. Volume 2, part 3: Marine meteorology
[WMO-364] N80-14660
OCEANS
Wave power systems
[PB-299851/4] N80-14576
OHIO
Construction and initial operation of the Miamisburg sub-gradient solar pond
[MLM-2656-OP] N80-14541
OIL RECOVERY
Surface water quality parameters for monitoring oil shale development
[PB-297984/7] N80-14470
OLIVINE
Petrology of the Apollo 12 pigeonite basalt suite
[LA-UR-79-1114] N80-15013
OMEGA NAVIGATION SYSTEM
Ground-based propagation measurements in support of flight evaluation of the E-3A OMEGA navigation system, June - November 1976
[AD-A074476] N80-14321
ONBOARD EQUIPMENT
On-board multispectral classification study
[NASA-CR-3134] N80-14760
OPERATING SYSTEMS [COMPUTERS]
The integrity of onboard computer programs: A solution
N80-14028
The avionics computer program: Practical experiences with a methodology — Mirage F1 and Mirage 200 aircraft
N80-14037
COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications
N80-14041
A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments
[NASA-CR-162557] N80-14791
OPERATIONS RESEARCH
Network functions and facilities
N80-14151
OPERATOR PERFORMANCE
Process model of how the human operator tracks discontinuous inputs
[AD-A069001] N80-14712
OPERATORS [MATHEMATICS]
Integrating matrices for arbitrarily spaced grid points
[NASA-CR-159172] N80-14836
OPTICAL COMMUNICATION
A new class of optical communication systems. I: Experiment
[AD-A074313] N80-14316
Measured performance of laser intensity subcarrier direct detection optical communication receivers
N80-14383
OPTICAL HETERODYNING
Light scattering from an arc plasma with stationary CO2 laser and heterodyne detection
[IPF-78-8] N80-14928
OPTICAL MEASUREMENT
A-3 scientific results
N80-14982
OPTICAL RADAR
The cost effectiveness of airborne laser hydrography
[PB-299057/0] N80-14668
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar
[NASA-CR-162555] N80-15025
OPTICAL RESONATORS
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341
OPTICAL TRACKING
Analysis of techniques for imaging through the atmosphere — speckle imagery for deep space object identification
[AD-A073640] N80-14901
OPTICAL WAVEGUIDES
Isometrically deformable synclastic surfaces as flexible waveguides
N80-14335
OPTIMAL CONTROL
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-81] N80-14828
OPTIMIZATION
Application of discrete gridmess and control theory
[AD-A074782] N80-14172
Viscous film flows with contact line: Finite element simulation, a basis for stability assessment and design optimization
N80-14351
Optimal rotating column
[CSIR-TWISK-74] N80-14401
'PROCOPES'. [Conversational program for signal analysis]: Evolvement of an interpretative control language
[ESA-TT-581] N80-14798
Contributions to constrained optimization — nonlinear programming
N80-14801
Transient response optimization of piezoelectric disc transducers by time domain techniques
[AD-A073818] N80-14847
ORBIT CALCULATION
Research in navigation and optimization for space trajectories
[NASA-CR-160438] N80-14364
Parameter estimation from satellite tracking data
[ESS/SS-919] N80-14566
ORBITAL POSITION ESTIMATION
Microcomputer-based on-line state estimation with applications to satellites
N80-14033
Parameter estimation from satellite tracking data
[ESS/SS-919] N80-14566
ORGANIC COMPOUNDS
Methods for calculation of engineering parameters for gas separation — vapor pressure and solubility of gases in organic liquids
[NASA-CR-162532] N80-14211
Volatile organic compounds in seawater — sources and transport mechanisms
[AD-A074179] N80-14234
Energy storing organic photoreactions
[AD-A074915] N80-14503
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern
[AD-A074829] N80-14583
ORGANIC MATERIALS
Microbial colonization of materials at Innisfail, Queensland
[MRL-TN-428] N80-14670
ORGANIC PHOSPHORUS COMPOUNDS
The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment
N80-14731
ORGANIC WASTES [FUEL CONVERSION]
Pilot plant gasification test on biomass fuels
[PB-299077/8] N80-14272
ORGANISMS
Underwater sound scattering by marine organisms. A review — sonar interference
[MRL-R-756] N80-14841
ORGANOMETALLIC COMPOUNDS
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252
ORGANOMETALLIC POLYMERS
Conductive polymers consisting of partially oxidized, face-to-face linked metallomacrocycles
[AD-A074538] N80-14251
OSCILLATING FLOW
FORTRAN subroutines for out-of-core solutions of large complex linear systems
[NASA-CR-159143] N80-14773
OSMOSIS
Kinematic analysis of osmotic processes under non-equilibrium conditions
N80-14669
OXIDATION
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14242
Preparation and catalytic oxidizing potential of polymer supported chelating amine and Schiff base complexes
[AD-A073878] N80-14250
Kinetic aspects of gas phase metal atom oxidation reactions — laser design
[AD-A074089] N80-14387
OXYGEN
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system
[IS-M-212] N80-14953
OXYGEN MASKS
Anthropometric sizing, fit-testing and evaluation of the MBU-12/P oral-nasal oxygen mask
[AD-A074723] N80-14692
OXYGEN SUPPLY EQUIPMENT
An advanced oxygen system for future combat aircraft
N80-14680
OZONE
Ozonation of cooling tower waters
[NASA-CASE-NPO-14340-1] N80-14579
Houston area oxidants study, program summary
[PB-299638/7] N80-14598
Aerometric data analysis for the Houston area oxidant study. Volume 3: Data summaries for the Houston area oxidant study
[PB-299649/4] N80-14602

Rocket ozone sounding network data [NASA-TM-73283] N80-14608
The stratosphere: Present and future [NASA-RP-1049] N80-14641
Radicals, reservoirs, and ions — important to stratospheric ozone photochemistry N80-14645
Long period changes in stratospheric parameters N80-14647
Model predictions — for ozone concentration changes in the atmosphere N80-14648
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants N80-14686
Photodissociation processes in molecular beams — ozone [LBL-9219] N80-14886

P

PAGEOS SATELLITE
Calculation of the azimuth of the section between Hohenpeissenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig] [SER-B-236] N80-14461
PALLADIUM
Palladium sintering: Shrinkage kinetics for a sponge powder [SAND-78-8207] N80-14241
PANAMA CANAL ZONE
Methodology investigation exposure/performance test of selected materiel items — Army equipment in Panama Canal zone [AD-A074001] N80-14406
PARABOLIC DIFFERENTIAL EQUATIONS
Numerical methods for a porous medium equation [ANL-78-80] N80-14365
PARABOLIC REFLECTORS
Solar concentrator [NASA-CASE-MFS-23727-1] N80-14473
PARALLEL PROCESSING [COMPUTERS]
A regular layout for parallel adders [AD-A074455] N80-14764
PARSING ALGORITHMS
Knowledge-based parsing [AD-A068666] N80-14774
PARTIAL DIFFERENTIAL EQUATIONS
Computation of moments of functionals of a solution to a stochastic differential equation [CSIR-TWISK-73] N80-14813
Acoustic equations in moving fluids N80-14860
PARTICLE COLLISIONS
High energy hadron-nucleus collisions [CU-TP-137] N80-14896
PARTICLE EMISSION
Imperial Valley environmental project: Air quality assessment [UCRL-52899] N80-14585
PARTICLE FLUX DENSITY
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system [NASA-TM-80173] N80-14771
PARTICLE SIZE DISTRIBUTION
Budgets — in determining the physical and chemical state of the stratosphere N80-14644
PARTICLE TRAJECTORIES
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system [NASA-TM-80179] N80-14771
PARTICULATE SAMPLING
Simultaneous mass detection for direct inlet mass spectrometry [PNL-2728] N80-14227
Particulate sampling and analysis [PB-299637/9] N80-14601
PARTONS
High energy hadron-nucleus collisions [CU-TP-137] N80-14896
PATIENTS
User requirements for a patient scheduling system [NASA-CR-162539] N80-14956
PATTERN RECOGNITION
SCANLINE: A computer program for converting raster maps into line maps [CSIR-TWISK-43] N80-14426
Information on cartography and geodesy. Series 1: Original report number 75 N80-14427
OVPREC: A program automatic recognition of overlapping zones of broadened cartographic line elements N80-14432
Study and investigation of infrared multispectral target casing techniques [AD-A074799] N80-14458
The decomposition of mixtures and classification using the gradient technique — an approach to pattern recognition [BMVG-FBWT-79-07] N80-14799
PAVEMENTS
Reflection cracking of bituminous overlays for airport pavements: A state of the art [AD-A073484] N80-14344
Construction of an ice-retardant overlay — asphalt additive [PB-298876/4] N80-14274
PERCEPTION
A mind/brain/matter model consistent with quantum physics and UFO phenomena [AD-A068985] N80-14711
PERFORMANCE PREDICTION
Ability, involvement and climate as multiple and interactive predictors of performance [AD-A068891] N80-14706
Work performance as a function of the interaction of ability, work values, and the perceived work environment [AD-A068893] N80-14707
PERFORMANCE TESTS
Performance evaluation methods of a secondary radar network N80-14068
Quiet Clean Short-Haul Experimental Engine (QCSEE) Over-The-Wing (OTW) propulsion system test report. Volume 2: Aerodynamics and performance — engine performance tests to define propulsion system performance on turbofan engines [NASA-CR-135324] N80-14120
The CF6 jet engine performance improvement: New front mount [NASA-CR-159639] N80-14127
Self-acting lift-pad geometry for circumferential seals: A noncontacting concept — performance tests on hydrodynamic seals [NASA-TP-1583] N80-14403
Methodology investigation exposure/performance test of selected materiel items — Army equipment in Panama Canal zone [AD-A074001] N80-14406
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector [NASA-CR-161253] N80-14497
PERIODIC VARIATIONS
Long period changes in stratospheric parameters N80-14647
PERIPHERAL VISION
Effect of peripherally presented visual signals on pilot performance during flight simulation [AD-A073604] N80-14703
PERMEABILITY
Dialysis system — using ion exchange resin membranes permeable to urea molecules [NASA-CASE-NPO-14101-1] N80-14687
PERSONNEL SELECTION
Problems related to medical criteria for the selection of military navigation personnel N80-14679
The European approach to the selection and training of SL payload specialists N80-14681
PERTURBATION THEORY
Research in navigation and optimization for space trajectories [NASA-CR-160420] N80-14164
Spectral invariance for normal operations under trace class perturbations N80-14803
PETROGRAPHY
Introduction to the Apollo collections: Part 2: Lunar breccias [NASA-CR-162559] N80-15013
PETROLOGY
Apollo 12 feldspathic basalts 12031, 12038, and 12072: petrology, comparison [LA-UR-79-1117] N80-15014
Petrology of the Apollo 12 pigeonite basalt suite [LA-UR-79-1116] N80-15015
PHASE DIAGRAMS
Quantum field theory methods applied to the physics of condensed matter [AD-A073509] N80-14940
PHASE LOCK DEMODULATORS
Suppression of interchannel interference in FM receivers [AD-A074485] N80-14324
PHASE LOCKED SYSTEMS
Dynamic clutter reduction techniques with moving target indicated adaptive filters N80-14080
Phase-locking in power oscillators N80-14085
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase I [NASA-CR-159453] N80-14182
PHASE SHIFT
The generalized phase shift approach to rotational excitation in dilute diatomic gases N80-14202
PHASE TRANSFORMATIONS
Ordering transitions in helium-4 submonolayers: A heat capacity study N80-14934
PHASED ARRAYS
Target tracking using Doppler-information in sensor oriented coordinates with a three dimensional array radar [REPT-270] N80-14325
PHONETICS
Speech compression and synthesis — vocoders [AD-A074497] N80-14315
PHONONS
The electron-phonon interaction spectrum in proximity effect copper N80-14937
PHOSPHORUS
The role of phosphorus in the intergranular embrittlement of Fe-Si N80-14230
PHOTOCHEMICAL OXIDANTS
Houston area oxidants study, program summary [PB-299638/7] N80-14598
Aerometric data analysis for the Houston area oxidant study. Volume 3: Data summaries for the Houston area oxidant study [PB-299640/3] N80-14602
The interaction of ozone with the human erythrocyte — biological effects of photochemical oxidants N80-14686
PHOTOCHEMICAL REACTIONS
Photosensitization mechanisms for energy storing isomerizations [AD-A074968] N80-14502
Energy storing organic photoreactions [AD-A074915] N80-14503
The stratosphere: Present and future [NASA-RP-1049] N80-14641
Laboratory measurements — for use in stratospheric modelling N80-14642
Radicals, reservoirs, and ions — important to stratospheric ozone photochemistry N80-14645
PHOTODISSOCIATION
Laser fluorescence studies of chemiluminescent chemical reactions [AD-A073429] N80-14213
Photodissociation processes in molecular beams — ozone [LBL-9219] N80-14886
PHOTOELASTIC ANALYSIS
Photoacoustic stress [UCRL-82594] N80-14419
PHOTOELECTRIC EMISSION
Photoemission studies of time-resolved surface reactions: Isothermal desorption of CO from Ni(3) [AD-A074953] N80-14221
High resolution threshold photoelectron spectroscopy by electron attachment [NASA-CASE-NPO-14078-1] N80-14877
PHOTOELECTRON SPECTROSCOPY
High resolution threshold photoelectron spectroscopy by electron attachment [NASA-CASE-NPO-14078-1] N80-14877
PHOTOGRAMMETRY
Simultaneous multiple camera and multiple focal setting self-calibration in photogrammetry N80-14372
On the use of digital photogrammetric measurements in the compilation of topographic maps [SER-I-ORIGINAL-REPT-76] N80-14462
PHOTOGRAPHIC MEASUREMENT
Speckle interferometry for a partially coherent source [AD-A074540] N80-15004
PHOTOGRAPHIC RECORDING
US Army Test and Evaluation Command test operations procedures: Photographic and video image support aviation materiel [AD-A074883] N80-14377
PHOTOINTERPRETATION
Forester's guide to aerial photo interpretation — timber inventory N80-14425
PHOTOIONIZATION
Post collision interaction in photoexcited argon LMM Auger processes [IPPJ-422] N80-14912
PHOTOMAPPING
On the use of digital photogrammetric measurements in the compilation of topographic maps [SER-I-ORIGINAL-REPT-76] N80-14462
PHOTOMETRY
The fundamentals of thermal imaging systems — study of infrared imagery, image processing, photometry, and imaging techniques [AD-A073763] N80-14902
PHOTON ABSORPTIOMETRY
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry N80-14210
PHOTON-ELECTRON INTERACTION
Post collision interaction in photoexcited argon LMM Auger processes [IPPJ-422] N80-14912
PHOTONS
Two photon spectroscopy of pyrazine and triazine [AD-A074055] N80-14219
Energy storing organic photoreactions [AD-A074915] N80-14503
PHOTOSENSITIVITY
Effect of rhythmic photostimulation on monkeys with hyperkinesis of post-encephalitic genesis [NASA-TM-75996] N80-14674

PHOTOSYNTHESIS
Electron spin echo spectroscopy and photosynthesis [CONF-780741-4] N80-14228
PHOTOVOLTAIC CELLS
Residential photovoltaic module and array requirements study, appendices [NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study [NASA-CR-162528] N80-14482
Photovoltaic power systems market identification and analysis [HCP/T4022-01] N80-14539
Photovoltaic incentives options [HCP/CS-0023] N80-14561
PHOTOVOLTAIC CONVERSION
Photovoltaic energy conversion in polymer films N80-14477
System tests and applications photovoltaic program [HCP/T4024-01/15] N80-14566
PHYSICAL CHEMISTRY
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern [AD-A074829] N80-14583
PHYSICAL FITNESS
Methods for evaluating the physical and effort requirements of Navy tasks: Metabolic, performance, and physical ability correlates of perceived effort [AD-A072497] N80-14720
PHYSIOLOGICAL EFFECTS
The effects of hypodynamia and hypokinesia on the arterial bed of pelvic limb muscles in the rabbit [NASA-TM-75904] N80-14673
Early transient incapacitation: A review with consideration of underlying mechanisms [AD-A071803] N80-14693
The effects of acute and chronic low dose exposure to anticholinesterases N80-14729
Workload and stress in air traffic controllers N80-14757
PHYSIOLOGICAL FACTORS
Physiological factors in space operations. Emphasis on space shuttle N80-14682
A consideration of factors contributing to strength differences in men and women [AD-A072671] N80-14694
Physiologic aspects of workload/fatigue/stress N80-14744
PHYSIOLOGICAL TESTS
Simulation of physiological systems in order to evaluate and predict the human condition in a space flight [NASA-TM-78016] N80-14716
PHYSIOLOGY
Methods for evaluating the physical and effort requirements of Navy tasks: Metabolic, performance, and physical ability correlates of perceived effort [AD-A072497] N80-14720
PICOSECOND PULSES
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating N80-14385
PIEZOELECTRIC CRYSTALS
Growth and characterization of epitaxial piezoelectric and semiconductor films [AD-A073813] N80-14943
PIEZOELECTRIC GAGES
Low impedance manganin stress gauge system for severe shock wave environments [UCRL-81605] N80-14379
PIEZOELECTRIC TRANSDUCERS
Transient response optimization of piezoelectric disc transducers by time domain techniques [AD-A073818] N80-14847
Optical probing of acoustic emission waves — acoustic measurement of acoustic emission using piezoelectric transducers compared optical techniques of measurement [AD-A074160] N80-14854
PILOT PERFORMANCE
Effect of peripherally presented visual signals on pilot performance during flight simulation [AD-A073604] N80-14703
Survey of methods to assess workload [AGARD-AG-246] N80-14739
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress N80-14740
Concepts of fatigue — survey of studies on pilot performance and flight fatigue discussed in terms of physiological and psychological stress N80-14741
Some considerations concerning methods to evaluate and assess workload in aircraft pilots N80-14743
Some insights relative to the man-machine system: An overview of ten years of research N80-14745
Aircrew workload assessment techniques — human factors engineering study of performance of flight crews workloads N80-14746
Workload assessment methodology development N80-14747
Visual performance: A method to assess workload in the flight environment N80-14749
Handling qualities, workload and heart rate N80-14750
Brain waves and the enhancement of pilot performance N80-14751
Pupillometric methods of workload evaluation: Present status and future possibilities — pilot workload N80-14752
Aircrew performance research opportunities using the Air Combat Maneuvering Range [ACMR] N80-14753
Speech patterns and aircrew workload N80-14754
PILOT PLANTS
Pilot plant gasification test on biomass fuels [PB-295077/8] N80-14272
The 10 MW solar thermal pilot plant dynamic simulation. Volume 1: Computer program description [ATR-78(7747)-1-VOL-1] N80-14550
The 10 MW solar thermal pilot plant dynamic simulation. Volume 2: Computer program source listing [ATR-78-(7747)-2-VOL-2] N80-14551
PILOT TRAINING
Meteorological input to general aviation pilot training N80-14634
Rule learning and systematic instruction in pilot training [AD-A068906] N80-14709
PILOTS [PERSONNEL]
Preliminary investigation of pilot scanning techniques of dial pointing instruments [NASA-TM-80079] N80-14697
PIONEER 11 SPACE PROBE
Pioneer 11 Saturn encounter mission support N80-14154
Pioneer Saturn encounter news briefing [NASA-TM-80353] N80-15009
PIONS
Pion nucleon interaction at low energy [ORO-5126-60] N80-14895
PIPELINING [COMPUTERS]
The Megaprocessor: A multiple-processor architecture based upon expression tree pipelining N80-14739
PIPES [TUBES]
Estimating structural integrity of Type 304 stainless steel plates and pipes containing small defects [CONF-790802-11] N80-14238
Piping and tubing technology: A compilation [NASA-SP-5903(01)] N80-14402
PISTON ENGINES
Exhaust emission reduction for intermittent combustion aircraft engines [NASA-CR-159757] N80-14130
PITUITARY GLAND
Micromorphology of neurohypophysis of rats under experimental conditions [NASA-TM-75947] N80-14671
PLANAR STRUCTURES
Antenna-coupled infrared detectors [AD-A074085] N80-14320
PLANETARY ATMOSPHERES
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionospheres. Conference, Germany Jul. 1975 [REPT-55/1977] N80-14609
Planetary ionospheres N80-14612
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres [PR-482] N80-15017
PLANETARY EVOLUTION
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres [PR-482] N80-15017
PLANETOLOGY
Planetary astronomy — asteroids, planets, and protoplanets [NASA-CR-162526] N80-15003
Future of planetary exploration — review of space exploration missions to study planets [NASA-TM-80352] N80-15010
PLANETS
Future of planetary exploration — review of space exploration missions to study planets [NASA-TM-80352] N80-15010
PLANFORMS
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover [NASA-TM-78615] N80-14049
PLANKTON
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977. [CNEXO-16-1978] N80-14667
PLANNING
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX [GARP-SPEC-REPT-32] N80-14656
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan [WMO-524] N80-14658
PLANTS [BOTANY]
Electron spin echo spectroscopy and photosynthesis [CONF-780741-4] N80-14228
PLASMA CONTROL
Stability of high density plasma in a multiple mirror [IPPJ-418] N80-14914
Very small aspect ratio tokamaks [CONF-780811-32] N80-14924
PLASMA CORE REACTORS
High temperature UF6 RF plasma experiments applicable to uranium plasma core reactors [NASA-CR-159159] N80-14921
PLASMA EQUILIBRIUM
Enhancement of D-T reaction rate due to D-T contact [IPPJ-419] N80-14913
PLASMA FOCUS
Soft X-ray measurements for investigating plasma focus dynamics [IPF-78-1] N80-14925
PLASMA HEATING
Ion heating by the current-driven turbulence in an inhomogeneous plasma [IPPJ-423] N80-14911
PLASMA INTERACTIONS
The current status of predictions of low energy plasma interactions with space systems — plasma interactions with spacecrafts in orbit due to space charge and magnetosphere [AD-A074523] N80-14186
PLASMA PHYSICS
Plasma physics of trapping of cosmic rays around supernova [PPPL-1558] N80-15024
PLASMA SPRAYING
Improved refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] N80-14232
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air [NASA-TM-79316] N80-14249
PLASMA TEMPERATURE
Super-banana limiter as a possible edge cooling scheme [IPPJ-425] N80-14918
PLASMA WAVES
Nonlinear shift of resonance velocity in interactions between particles and plasma cyclotron waves [IPPJ-421] N80-14916
PLASMA-ELECTROMAGNETIC INTERACTION
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges N80-14206
Microwave magnetoplasma effects in semiconductor powers and arrays of spheres N80-14933
PLASMA-PARTICLE INTERACTIONS
Nonlinear shift of resonance velocity in interactions between particles and plasma cyclotron waves [IPPJ-421] N80-14916
PLASMAS [PHYSICS]
Infrared laser window coating by plasma polymerization [AD-A075008] N80-14393
A multiple species ion energy analyzer applied to laser-induced plasma experiments N80-14909
Investigation of molybdenum impurity diffusion during hydrogen gas puffing in JIPP T-II plasma [IPPJ-412] N80-14915
Interaction of high voltage surfaces with the space plasma — solar arrays [NASA-CR-159731] N80-14923
PLATES [STRUCTURAL MEMBERS]
Off-center, low velocity, transverse normal impact of a simply supported plate [AD-A074946] N80-14416
POINT SOURCES
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines [ONERA-RTS-1/3127-EY] N80-14195
POINTING CONTROL SYSTEMS
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation [NASA-TM-80136] N80-14163
POLAR REGIONS
VLF/LF reflectivity of the polar ionosphere, 3 September - 30 December 1978 [AD-A074475] N80-14317
Polar ionosphere N80-14611
POLAROGRAPHY
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry [AD-A074096] N80-14216
POLLUTION CONTROL
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion — models for environmentally clean power plant design [COO-4272-3] N80-14587

Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 1
[PB-299191/7] N80-14590
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 2
[PB-299192/5] N80-14591
Fugitive and fine particle control using electrostatically charged fog
[PB-298069/6] N80-14593
Development of treatment and control technology for refractory petrochemical wastes
[PB-299291/5] N80-14596

POLLUTION MONITORING
Performance evaluation of the Horiba Instruments, Incorporated model U-7 water quality checker
[PB-298815/2] N80-14582
Environment and the quality of life
[EUR-5970] N80-14582
Accuracy of remotely sensed SO2 mass emission rates
[PB-298077/9] N80-14594
Particulate sampling and analysis
[PB-299637/9] N80-14601
Investigation of effects of temperature, salinity, and electrode design on the performance of an electrochemical coliform detector
[NASA-TM-80130] N80-14676

POLYCRYSTALS
Microstructural investigation of polycrystalline iron whiskers
[AD-A074708] N80-14198
Silicon materials outlook study for 1980-1985 calendar years
[NASA-CR-162541] N80-14492
Diffusional mass transport in polycrystals containing stationary or migrating grain boundaries
[COO-9002-1] N80-14949

POLYIMIDE RESINS
Quiet Clean Short-Haul Experimental Engine [QCSEE] Under-The-Wing [UTW] graphite/PMR cowl development
[NASA-CR-135279] N80-14119
Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79314] N80-14196
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159164] N80-14197

POLYMER CHEMISTRY
Polystyrene in mixed solvents
N80-14245

POLYMER MATRIX COMPOSITE MATERIALS
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159164] N80-14197

POLYMERIC FILMS
Procedure for the formation of a coating on an object by polymerization by luminescent discharge
[NASA-TM-75926] N80-14248
Infrared interferometric thickness measurement of polymeric thin films and coatings
[Y-2176] N80-14254
Photovoltaic energy conversion in polymer films
N80-14477

POLYMERIZATION
Procedure for the formation of a coating on an object by polymerization by luminescent discharge
[NASA-TM-75926] N80-14248
Infrared laser window coating by plasma polymerization
[AD-A075008] N80-14393

POLYPROPYLENE
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14201

POLYSTYRENE
Polystyrene in mixed solvents
N80-14245
Syntheses and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14246
Preparation and catalytic oxidizing potential of polymer supported chelating amine and Schiff base complexes
[AD-A073878] N80-14250

POPULATION THEORY
On Bayes and gamma-minimax subset selection rules
N80-14823

POROUS MATERIALS
An experimental study of natural convection heat transfer in vertical porous media
N80-14352
Numerical methods for a porous medium equation
[ANL-78-80] N80-14365
Propagation in acoustically absorbent materials
N80-14865

POROUS WALLS
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3210] N80-14047

PORTABLE LIFE SUPPORT SYSTEMS
Regenerative CO2 removal for PLSS application
[NASA-CR-160419] N80-14718

POSITION [LOCATION]
Laser-optical blade tip clearance measurement system
[NASA-TM-81370] N80-14128

POSITION ERRORS
Determination of the repeatability of PEC — flight tests for position error calibrating
[AETE-PR-79/36] N80-14109

POSITION INDICATORS
A high accuracy flight profile determining system — systems analysis of inertial navigation system for aircraft position determination
N80-14042

POSITRONS
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system
[NASA-TM-80179] N80-14771

POTENTIOMETERS [INSTRUMENTS]
Preliminary study of some graphite electrode surfaces responsive to iron and heavy metals by single-sweep voltammetry
[AD-A074605] N80-14343

POWDER [PARTICLES]
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252

POWDER METALLURGY
The improvement of refractory alloys through powder metallurgy involving sintering with spinning
[ONERA-RT-12/1931-MY] N80-14243

POWER AMPLIFIERS
Evaluation of the VA-876P klystron for the 20-kW X-band uplink transmitter
N80-14157

POWER CONDITIONING
Self-reconfiguring solar cell system
[NASA-CASE-LEW-12586-1] N80-14472

POWER EFFICIENCY
Power factor controller
[NASA-TM-80755] N80-14479

POWER LINES
Energy analysis of the basic materials utilized in electric power transmission systems
[HCP/T5043-01] N80-14510

POWER SPECTRA
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
Power spectra of geomagnetic fluctuations between 0.4 and 40 Hz
[AD-A074378] N80-14616

POWER SUPPLY CIRCUITS
Operating-manual for the Dynamic Test Set [DTS] for the low voltage power supply part of the AN/ALQ-119 V electronic countermeasures system
[AD-A074894] N80-14345

PREAMPLIFIERS
Energy-dependent losses in pulsed-feedback preamplifiers
[LBL-8135] N80-14348

PREDICTION ANALYSIS TECHNIQUES
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133
Agroclimatological methods involving remote sensing techniques
N80-14451
Crop monitoring and prediction using satellite data
N80-14455

PRESERVING
A controlled rate freeze/thaw system for cryopreservation of biological materials
[NASA-CR-162531] N80-14675

PRESSURE
Temperature and pressure measurement techniques for an advanced turbine test facility
[NASA-TM-79278] N80-14374
Surface conforming thermal/pressure seal — for control devices in space vehicles
[NASA-CASE-MSC-18422-1] N80-14400

PRESSURE BREATHING
An advanced oxygen system for future combat aircraft
N80-14680

PRESSURE DISTRIBUTION
Wall pressure fluctuations generated by a pair of vortices
[MPIS-6/1979] N80-14369

PRESSURE EFFECTS
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14201

PRESSURE GRADIENTS
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer — in a wind tunnel
[MPIS-MITT-68] N80-14368

PRESSURE MEASUREMENTS
Dissociation pressure measurements on salts proposed for thermochemical energy storage
[SAND-79-8033] N80-14532
Experimental measurements of moving noise sources
N80-14868
Aeroacoustic measuring techniques in or outside turbulent flows
N80-14876

PRESSURE REDUCTION
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14474-1] N80-14229

PRESSURE REGULATORS
Intra-ocular pressure normalization technique and equipment
[NASA-CASE-LEW-12955-1] N80-14684

PRIMARY BATTERIES
Lithium inorganic electrolyte battery development
[AD-A073858] N80-14505

PRINTED CIRCUITS
Test specification for two-sided printed circuit boards [gold plated finish]
[ESA-PSS-05/QRM-10E-ESTEC-ISS-2] N80-14350

PRINTERS [DATA PROCESSING]
Comparison of high speed printer interface characteristics
[PB-298943/2] N80-14767

PRISMS
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11426] N80-14808

PROBABILITY THEORY
Qualitative dependency among random variables, with applications in probability and statistics
N80-14822
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-61] N80-14828

PROBLEM SOLVING
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom
[NASA-TM-80153] N80-14055
Mathematical techniques for acoustic propagation problems
N80-14962
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions
[IPPJ-417] N80-14910

PRODUCT DEVELOPMENT
Development of mullite substrates and containers
[NASA-CR-162543] N80-14485
Environmental testing of block 3 solar cell modules. Part 1: Qualification testing of standard production modules
[NASA-CR-162547] N80-14489
Improved thermal battery performance
[AD-A073856] N80-14506

PROGRAM VERIFICATION [COMPUTERS]
An assessment of and approach to the validation of digital flight control systems
N80-14036
Simulation use in the development and validation of HiMAT flight software
N80-14039
Analysis of logical ripple effect of program modification
N80-14760

PROGRAMMING LANGUAGES
FORTRAN for avionics
N80-14022
'PROCOPES'. [Conversational program for signal analysis]: Evolvement of an interpretative control language
[ESA-TT-581] N80-14788
Search. A section of the handbook of artificial intelligence
[AD-A074078] N80-14797

PROJECT MANAGEMENT
Space transportation system shuttle turnabout analysis report
[NASA-TM-80840] N80-14177
Report to the Congress on the coordination of Federal energy conservation programs involving state and local governments
[DOE/TIC-10127] N80-14515
Geothermal energy: Program summary
[DOE/ET-0101] N80-14542
OTEC-1 test conductor program — project management quality control
[CONF-780550-9] N80-14563

PROJECT PLANNING
Commercialization strategy report for hydrothermal electric and direct heat application — project planning of geothermal resources for geothermal energy conversion for heating electricity generation
[TID-2884-DRAFT] N80-14508

PROPAGATION MODES
Propagation in circular waveguides
N80-14294
Design of the transmission media of circular waveguides
N80-14295
Measurement and characterization of manufacturing and installation imperfections of circular waveguides
N80-14299
Measuring methods of the electromagnetic characteristics of circular waveguides
N80-14300

PROPELLANT COMBUSTION
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2
[AD-A073871] N80-14194

PROPELLANT DECOMPOSITION
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A076963] N80-14262
PROPELLANT GRAINS
The development of improved normal stress transducers for propellant grains, volume 1
[AD-A073859] N80-14260
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices
[AD-A073860] N80-14261
PROPHYLAXIS
Considerations of pyridostigmine as a prophylactic agent for aircrew
N80-14730
PROPORTIONAL COUNTERS
Monitor proportional counter
N80-14995
PROPULSION SYSTEM CONFIGURATIONS
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
Propulsion options for the HI SPOT long endurance drone airship
[AD-A074395] N80-14132
An analysis of external burning propulsion
[AD-A074639] N80-14192
PROPULSION SYSTEM PERFORMANCE
Quiet Clean Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] propulsion system test report. Volume 2: Aerodynamics and performance — engine performance tests to define propulsion system performance on turbofan engines
[NASA-CR-135324] N80-14120
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-valve controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531] N80-14123
An analysis of external burning propulsion
[AD-A074639] N80-14192
PROPULSIVE EFFICIENCY
Quiet Clean Short-Haul Experimental Engine [QCSEE]. Under-the-wing [UTW] engine boilerplate Nacelle test report. Volume 2: Aerodynamics and performance
[NASA-CR-135250] N80-14116
Assessment of in situ diagnostics for application to rocket propulsion problems
[AD-A073520] N80-14190
PROTECTION
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738
PROTECTIVE CLOTHING
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL] N80-14728
Concerning individual equipment for fighter pilots in the Air Force
N80-14735
US aircrew chemical defense ensembles
N80-14736
FRG aircrew chemical defence ensembles
N80-14737
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738
PROTECTIVE COATINGS
Protective coatings for aircraft composites in nuclear environments
[AD-A074889] N80-14199
Improved refractory coatings and method of producing the same
[NASA-CASE-LEW-13169-1] N80-14232
Corrosion resistance of sodium sulfate coated cobalt-chromium-aluminum alloys at 900 C, 1000 C, and 1100 C
[NASA-TM-79311] N80-14234
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
Infrared laser window coating by plasma polymerization
[AD-A075008] N80-14393
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-162542] N80-14486
PROTOPLANETS
Planetary astronomy — asteroids, planets, and protoplanets
[NASA-CR-162526] N80-15003
PROXIMITY
The electron-phonon interaction spectrum in proximity effect copper
N80-14937
PSYCHOLOGY
A study in procedural manipulation of locus of control
[AD-A068658] N80-14704
PSYCHOPHYSICS
A mind/brain/matter model consistent with quantum physics and UFO phenomena
[AD-A068988] N80-14711
PSYCHOPHYSIOLOGY
An exploratory study of psychophysiological measurements as indicators of air traffic control sector workload
N80-14725
PUBLIC HEALTH
Environment and the quality of life
[EUR-5970] N80-14582
Health effects of aerosols emitted from an activated sludge plant
[PB-299583/9] N80-14696
PULSARS
High energy X-ray results from HEAO-1: X-ray pulsars, and the all sky survey
N80-14984
Possible radio emission mechanism for pulsars
[NASA-TM-75715] N80-15023
PULSE COMMUNICATION
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission
N80-14030
Extrapolation techniques for the evaluation of digital communications equipment
N80-14282
PULSE COMPRESSION
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications — time compression of laser pulses
[UCRL-TRANS-11429] N80-14908
PULSE GENERATORS
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation
[IPPJ-32] N80-14917
PULSED LASERS
Forward and backward stimulated Raman scattering in a multimode fiber
[CONF-780688-2] N80-14394
PULSED RADIATION
Energy-dependent losses in pulsed-feedback preamplifiers
[LBL-8135] N80-14348
Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839
PUPILLOMETRY
Pupillometric methods of workload evaluation: Present status and future possibilities — pilot workload
N80-14752
PURIFICATION
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14474-1] N80-14229
PYROLYSIS
Carborane synthesis — thermolysis of tetraethyl ammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570] N80-14217

Q

QUALITY CONTROL
Ultraviolet spectroscopic methods for quality control
[MHSMP-79-29] N80-14407
Development of an accelerated test design for predicting the service life of the solar array at Mead, Nebraska
[NASA-CR-162534] N80-14483
OTEC-1 test conductor program — project management quality control
[CONF-780550-9] N80-14563
QUANTUM CHROMODYNAMICS
Topics in the QCD phenomenology of deep-inelastic scattering
[SLAC-PUB-2290] N80-14950
QUANTUM MECHANICS
Classical theory of radiative transitions
N80-14285
Some double resonance and multiple quantum NMR studies in solids — quantum mechanics study of nuclear magnetic resonance on line shape and spin resonance of solids
[LBL-8042] N80-14883
QUANTUM THEORY
Quantum field theory methods applied to the physics of condensed matter
[AD-A073509] N80-14940
QUARTZ
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341
QUASARS
Einstein observations of active galaxies and quasars
N80-14997
QUIET ENGINE PROGRAM
Quiet Clean Short-Haul Experimental Engine [QCSEE] acoustic and aerodynamic tests on a scale model over-the-wing thrust reverser and forward thrust nozzle
[NASA-CR-135254] N80-14115
Quiet Clean Short-Haul Experimental Engine [QCSEE]. Under-the-wing [UTW] engine boilerplate Nacelle test report. Volume 2: Aerodynamics and performance
[NASA-CR-135250] N80-14116
Quiet, Clean, Short-Haul, Experimental Engine [QCSEE] Under-The-Wing [UTW] engine acoustic design
[NASA-CR-135267] N80-14117
Quiet, Clean, Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] engine acoustic design
[NASA-CR-135268] N80-14118
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556] N80-14121

R

RADAR
Monopulse receiver performance in SSR and DABS systems
N80-14093
RADAR ANTENNAS
Preliminary study on the utilization of adaptive radar receivers with diversity polarization
N80-14081
Preliminary analysis and selection criteria for an antenna for a secondary radar system
N80-14091
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
A generalized sidelobe canceling structure for adaptive arrays
[AD-A074899] N80-14319
RADAR BEACONS
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS]
N80-14097
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14301
A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14302
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14303
RADAR DATA
Radar data utilization in automating the sequencing of aircrafts in terminal areas
N80-14071
A distributed processing system for radar data presentation
N80-14073
Filtering of synthetic radar data
N80-14076
RADAR ECHOES
Preliminary study on the utilization of adaptive radar receivers with diversity polarization
N80-14081
RADAR EQUIPMENT
The influence of transmitter stability on primary radar performance
N80-14084
RADAR FILTERS
Dynamic clutter reduction techniques with moving target indicated adaptive filters
N80-14080
RADAR IMAGERY
Image transmission via spread spectrum techniques — synthetic aperture radar
[AD-A074606] N80-14308
RADAR NETWORKS
Problems related to the design and construction of a radar network
N80-14066
Methodology for the evaluation of a radar site
N80-14067
Organization of an integrated global maintenance service — Radar Networks
N80-14069
Simulation of communications protocols for a tactical radar network. Part 1: Executive summary
[AD-A074157] N80-14318
RADAR RANGE
The range reduction of primary radar due to rain
N80-14082
RADAR RECEIVERS
Preliminary study on the utilization of adaptive radar receivers with diversity polarization
N80-14081
Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086
Monopulse receiver performance in SSR and DABS systems
N80-14093

Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098
RADAR SCATTERING
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar
[NASA-CR-162558] N80-15025
RADAR SIGNATURES
Filtering of synthetic radar data
N80-14076
Kalman filter processing of position and Doppler radar measurement in coupled Cartesian coordinates
[REPT-276] N80-14459
RADAR TRACKING
Problems related to the design and construction of a radar network
N80-14066
Methodology for the evaluation of a radar site
N80-14067
Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072
Tracking algorithms for mono and multiradar
N80-14074
Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105
Simulation of communications protocols for a tactical radar network. Part 1: Executive summary
[AD-A074157] N80-14318
Target tracking using Doppler-information in sensor oriented coordinates with a three dimensional array radar
[REPT-276] N80-14325
RADAR TRANSMISSION
Performance evaluation of a coherent chain in transmission
N80-14083
The influence of transmitter stability on primary radar performance
N80-14084
Phase-locking in power oscillators
N80-14085
RADAR TRANSMITTERS
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14103
RADARSCOPES
Visual displays for air traffic control data
N80-14077
RADIANT COOLING
Super-banana limiter as a possible edge cooling scheme
[IPPJ-425] N80-14918
RADIATION COUNTERS
Contribution Monte Carlo — for calculating target response
[LA-7849-MS] N80-14817
RADIATION DAMAGE
Reactor for simulation and acceleration of solar ultraviolet damage
[NASA-CR-162533] N80-14405
RADIATION DISTRIBUTION
Directivity of acoustic radiation from sources
N80-14863
Propagation from moving sources in flows — jet aircraft noise
N80-14869
Theoretical studies relating to the interaction of radiation with matter: Atomic collision processes occurring in the presence of radiation fields
[AD-A074183] N80-14881
RADIATION DOSAGE
Method for analyzing radiation sensitivity of integrated circuits
[NASA-CASE-NPO-14350-1] N80-14332
RADIATION EFFECTS
Early transient incapacitation: A review with consideration of underlying mechanisms
[AD-A071803] N80-14693
Theoretical studies relating to the interaction of radiation with matter: Atomic collision processes occurring in the presence of radiation fields
[AD-A074183] N80-14881
RADIATION MEASURING INSTRUMENTS
Space Dosimetry. Volume 1: Project description
[FRI-R646/3-VOL-1] N80-14380
RADIATION SHIELDING
Space Dosimetry. Volume 1: Project description
[FRI-R646/3-VOL-1] N80-14380
RADIATION SICKNESS
Early transient incapacitation: A review with consideration of underlying mechanisms
[AD-A071803] N80-14693
RADIATION TOLERANCE
Iodine stress-corrosion cracking in irradiated Zircaloy cladding
[CONF-790441-7] N80-14237
Method for analyzing radiation sensitivity of integrated circuits
[NASA-CASE-NPO-14350-1] N80-14332
RADIATIVE TRANSFER
Models — for the stratosphere
N80-14643
RADICALS
Radicals, reservoirs, and ions — important to stratospheric ozone photochemistry
N80-14645
RADIO ASTRONOMY
X-ray variability observed with HEAO A-1
N80-14978
RADIO EMISSION
Possible radio emission mechanism for pulsars
[NASA-TM-75715] N80-15023
RADIO FREQUENCIES
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation
[IPPJ-32] N80-14917
RADIO FREQUENCY INTERFERENCE
Robust waveform design
[AD-A074932] N80-14311
Suppression of interchannel interference in FM receivers
[AD-A074485] N80-14324
RADIO INTERFEROMETERS
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603
RADIO RECEIVERS
Earth terminal subsystem study. Volume 1: Small terminal cost analysis — radio equipment
[AD-A073429] N80-14305
Suppression of interchannel interference in FM receivers
[AD-A074485] N80-14324
RADIO RECEPTION
Suppression of interchannel interference in FM receivers
[AD-A074485] N80-14324
RADIO RELAY SYSTEMS
Linear modulation techniques for digital microwave
[AD-A074047] N80-14323
RADIOACTIVE WASTES
Evaluation of potential chemical/mechanical degradation processes affecting fuel and structural materials under long-term water storage
[NUREG-CR-0668] N80-14223
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles, volume 1
[PB-299105/7] N80-14974
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles. Volume 2: Appendices
[PB-299106/5] N80-14975
RADIOBIOLOGY
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392
RAIN
The range reduction of primary radar due to rain
N80-14082
Comparison between the first pluviometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite — to study rain structures affecting radio channels at millimetric wavelengths
N80-14089
RAINDROPS
The range reduction of primary radar due to rain
N80-14082
RAMAN SPECTRA
Forward and backward stimulated Raman scattering in a multimode fiber
[CONF-780688-2] N80-14394
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility
N80-14930
RAMAN SPECTROSCOPY
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solution
[AD-A074567] N80-14220
RAMJET ENGINES
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133
RANDOM NOISE
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description
[ESA-CR[P]-878-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR[P]-878-VOL-3] N80-14783
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description
[ESA-CR[P]-1228-VOL-2] N80-14785
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques
[ESA-CR[P]-1228-VOL-3] N80-14786
RANDOM NUMBERS
A simple procedure for simulation of homogenous Markhov chains on a computer
[ESA-TT-529] N80-14787
RANDOM PROCESSES
Optimal steering of a random motion of a point mass
[CSIR-TWISK-71] N80-14812
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-81] N80-14828
Random propagation and random scattering — acoustic wave propagation
N80-14871
RANDOM VARIABLES
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperm unknown
[TR-41] N80-14804
Qualitative dependency among random variables, with applications in probability and statistics
N80-14822
RANGE [EXTREMES]
Design criteria for characterizing individuals in the extreme upper and lower body size ranges
[AD-A072553] N80-14721
RANGE AND RANGE RATE TRACKING
Parameter estimation from satellite tracking data
[ESS/SS-919] N80-14146
RANGE FINDERS
Non-contacting electro-optical contouring of helicopter rotor blades
[AD-A070806] N80-14111
RANGES [FACILITIES]
Aircrew performance research opportunities using the Air Combat Maneuvering Range [ACMR]
N80-14753
RARE GASES
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres
[PB-482] N80-15017
RATINGS
Rating errors of inconsistency as a function of dimensionality of behavioral anchors
[AD-A060922] N80-14710
RAY TRACING
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
Ray tracing and application of the geometrical theory of diffraction for calculating the scattered fields of complicated structures
[ESA-TT-595] N80-14789
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
REACTION KINETICS
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14305
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
Carborane synthesis — thermolysis of tetraethyl ammonium borohydride to tetraethylammonium decahydrodecaborate
[AD-A074570] N80-14217
The kinetics and spectroscopy of aircraft and rocket plume constituents
[AD-A074220] N80-14222
Electron spin echo spectroscopy and photosynthesis
[CONF-780741-4] N80-14228
Kinetic aspects of gas phase metal atom oxidation reactions — laser design
[AD-A074089] N80-14387
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion — models for environmentally clean power plant design
[COO-4272-3] N80-14587
Laboratory measurements — for use in stratospheric modelling
N80-14642
Molecular reaction rates
[AD-A073851] N80-14882
Enhancement of D-T reaction rate due to D-T contact
[IPPJ-419] N80-14913
REACTOR CORES
Ultrasonic density detector for vessel and reactor core two-phase measurements
[CONF-790646-5] N80-14361
REACTOR MATERIALS
Materials studies for magnetic fusion energy applications at low temperatures-II
[PB-299281/1] N80-14244
REAL TIME OPERATION
Automation of flight control: The case of speed control on pre-established routes
N80-14070
Real-time ISEE data system
[NASA-CR-162549] N80-14173
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728] N80-14227
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603

A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments [NASA-CR-162557] N80-14791
Simulation and real-time system design: An integrated approach N80-14795
REBREATHING
Regenerative CO2 removal for PLSS application [NASA-CR-160419] N80-14718
RECEIVERS
Robust waveform design [AD-A074932] N80-14311
Measured performance of laser intensity subcarrier direct detection optical communication receivers N80-14383
RECYCLING
Energy conservation in the US economy from increased recycle of obsolete steel scrap [COO-2893-10] N80-14534
REDUNDANCY
Redundancy management considerations for a control-configured fighter aircraft: triplex digital fly-by-wire flight control system N80-14026
Failure detection, isolation and indication in highly integrated digital guidance and control system N80-14027
A redundant inertial navigation system for IUS N80-14029
REENTRY SHIELDING
Thermal protection system flight repair kit [NASA-CR-160417] N80-14176
Shuttle orbiter TPS flight repair kit development [NASA-CR-160416] N80-14179
Thermal protection system repair kit program [NASA-CR-160418] N80-14181
REENTRY VEHICLES
Development and application of a laser velocimeter to measure very high speed particle velocities — reentry nose tip erosion and ablation [AD-A073859] N80-14388
REFLECTANCE
High frequency scattering from a thin lossless dielectric slab [NASA-CR-162564] N80-14290
REFRACTED WAVES
Fundamentals of sound reflection and refraction in inhomogeneous media — atmospheric propagation N80-14861
REFRACTIVITY
IR optical properties of thin H2O, NH3, and CO2 cryofilms [AD-A074913] N80-14944
REFRACTORY MATERIALS
Improved refractory coatings and method of producing the same [NASA-CASE-LEW-13169-1] N80-14232
REFRACTORY METAL ALLOYS
The improvement of refractory alloys through powder metallurgy involving sintering with spinning [ONERA-RT-12/7931-MY] N80-14343
REGENERATIVE COOLING
Performance of a transpiration-regenerative cooled rocket thrust chamber [NASA-CR-159742] N80-14189
REGIONAL PLANNING
Satellite remote sensing for agricultural advisories and planning N80-14457
REGOLITH
Regolith layering processes based on studies of low-temperature volatile elements in Apollo core samples [CONF-790381-1] N80-15016
REGULATIONS
Barriers to the application of wind energy conversion systems in urban settings N80-14494
REINFORCED PLASTICS
Evaluation of alternate vanadium compounds for use in fiberglass reinforced plastic soil surfacing [AD-A074871] N80-14615
RELATIVISTIC ELECTRON BEAMS
Equilibrium and propagation of a rotating relativistic electron beam in the absence of an external guide field [AD-A074803] N80-14834
Rigid-rotor equilibrium of intense relativistic electron beam [AD-A073318] N80-14892
RELATIVITY
Vacuum polarization in curved spacetime — stress tensor determination N80-14951
RELIABILITY
COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications N80-14041
RELIABILITY ANALYSIS
Study of turboprop systems reliability and maintenance costs [NASA-CR-135192] N80-14129
A probabilistic study of wind-electric conversion systems from the point of view of reliability and capacity credit N80-14475
RELIABILITY ENGINEERING
US Army Test and Evaluation Command test operations procedures: Photographic and video image support aviation materiel [AD-A074883] N80-14377
REMOTE MANIPULATOR SYSTEM
Coupling device for moving vehicles [NASA-CASE-GSC-12322-1] N80-14398
REMOTE SENSORS
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York N80-14424
Satellite Remote Sensing: Applications in Agrometeorology and Agroclimatology [ESA-SP-1020] N80-14440
Overview of remote sensing for agrometeorology and agroclimatology N80-14442
Physical background of remote sensing — multispectral reconnaissance of the Earth surface N80-14443
Remote sensing applied to agriculture N80-14446
The ESA remote sensing program: Present activities and future plans N80-14449
Agroclimatological methods involving remote sensing techniques N80-14451
Crop monitoring and prediction using satellite data N80-14455
Satellite remote sensing in hazard monitoring and disaster evaluation N80-14456
Accuracy of remotely sensed SO2 mass emission rates [PB-298077/9] N80-14594
A study of the relationship between oceanic chemical mesoscale and sea surface thermal structure as detected by satellite infrared imagery [AD-A074186] N80-14663
REMOTELY PILOTED VEHICLES
Experience in producing software for the ground station of a remotely piloted helicopter system N80-14038
Simulation use in the development and validation of HIMAT flight software N80-14039
REPEATERS
General criteria for the design of repeating stations of circular waveguide systems N80-14298
Measuring methods of repeater characteristics for circular waveguide systems N80-14301
REQUIREMENTS
Residential photovoltaic module and array requirements study, appendices [NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study [NASA-CR-162528] N80-14482
RESCUE OPERATIONS
Navy combat search and rescue [AD-A074593] N80-14062
RESEARCH
Current research on aviation weather [bibliography], 1979 [NASA-CR-3214] N80-14651
RESEARCH AIRCRAFT
Quiet short-haul research aircraft familiarization document — STOL [NASA-TM-81169] N80-14108
The T-28 thunder/hailstorm penetration aircraft N80-14640
RESEARCH AND DEVELOPMENT
French space programs N80-14165
Status of the DOE/NASA critical gas turbine research and technology project [NASA-TM-79307] N80-14493
RESEARCH FACILITIES
French space programs N80-14165
Aeronautical Research Laboratories [RMT8/30107] N80-15026
RESEARCH MANAGEMENT
NASA broad-specification fuels combustion technology program: Status and description [NASA-TM-79315] N80-14126
Materials studies for magnetic fusion energy applications at low temperatures-II [PB-299288/1] N80-14244
Dual beam dual mode TWT [AD-A074719] N80-14344
Unsteady flow and dynamic response analyses for helicopter rotor blades [NASA-CR-159190] N80-14355
NBS interagency transducer project 1951 - 1979: An overview [NBS-TN-1110] N80-14373
A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments [NASA-CR-162557] N80-14791
Assessing the output of Federal commercially directed R/D [PB-299223/7] N80-14961
West Coast Forum on Appropriate Technology — research in energy and environmental areas [PB-298986/1] N80-14962
RESIDENTIAL AREAS
Residential photovoltaic module and array requirements study, appendices [NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study [NASA-CR-162528] N80-14482
RESONANCE SCATTERING
The use of resonance epithermal neutron scattering for the study of condensed matter N80-14936
RESONANT FREQUENCIES
Resonant frequency of microstrip antennas calculated from TE-excitation of an infinite strip embedded in a grounded dielectric slab [NASA-TM-80190] N80-14239
RESONATORS
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation [PPPL-32] N80-14917
RESOURCE ALLOCATION
Assessing the output of Federal commercially directed R/D [PB-299223/7] N80-14961
RESOURCES MANAGEMENT
Energy from the West: Energy resource development systems report. Volume 6: Geothermal [PB-299182/6] N80-14468
Management Analysis of Key Resource Operations [MAKRO], volume 1 [AD-A069016] N80-14957
Management analysis of Key Resource Operations [MAKRO]. Volume 2, Appendix E: Networks. Annexes 1 and 2: Planning and programming [AD-A069017] N80-14958
Management Analysis of Key Resource Operations [MAKRO]. Volume 3, Appendix E: Networks. Annex 3: Budget formulation [AD-A069018] N80-14959
RETINA
A facilitation effect in orientation discrimination [AD-A072726] N80-14713
RETRACTABLE EQUIPMENT
Antenna deployment mechanism for use with a spacecraft — extensible and retractable telescopic antenna mast [NASA-CASE-GSC-12331-1] N80-14183
REUSABLE SPACECRAFT
DOD STS ground support systems [VCR-76-032-05] N80-14178
RHYTHM [BIOLOGY]
Sleep and body rhythm disturbance in long-range aviation. The problem and a search for relief N80-14714
RIBBONS
Method for forming a solar array strip [NASA-CASE-NPO-13652-3] N80-14474
RIBONUCLEIC ACIDS
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization [NASA-TM-75983] N80-14672
RIGID ROTORS
Rigid-rotor equilibrium of intense relativistic electron beam [AD-A073318] N80-14892
RINGS [MATHEMATICS]
Boolean valued models and Galois theory for commutative regular rings N80-14832
ROCKET EXHAUST
The 0.1 wavenumber spectral measurements in the region from 2050 - 2410 wavenumbers of a static, experimental rocket motor at three pressure altitudes [AD-A073704] N80-14191
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code [AD-A074914] N80-14193
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2 [AD-A073871] N80-14194
The kinetics and spectroscopy of aircraft and rocket plume constituents [AD-A074220] N80-14222
ROCKET SOUNDING
Rocket ozone sounding network data [NASA-TM-73283] N80-14608
ROCKET VEHICLES
Coupling device for moving vehicles [NASA-CASE-GSC-12322-1] N80-14398
ROCKET-BORNE INSTRUMENTS
Research in aeronomy — ionospheric theory, rocket experiments, partial reflection, meteor radar, coherent scatter-radar, and laser radar [NASA-CR-162558] N80-15025
ROLLING MOMENTS
Effect of spanwise gust variations N80-14639

ROOTS OF EQUATIONS
Finding the root of a monotonic function
[CSIR-TWISK-75] N80-14806
ROTARY WINGS
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615] N80-14049
Acoustically swept rotor — helicopter noise reduction
[NASA-CASE-ARC-11106-1] N80-14107
Non-contacting electro-optical contouring of helicopter rotor blades
[AD-A070806] N80-14111
Investigation of the oscillatory and flight behavior of rotor systems in relation with atmospheric turbulence
[BMVG-FBWT-79-5] N80-14142
Unsteady flow and dynamic response analyses for helicopter rotor blades
[NASA-CR-159190] N80-14255
High frequency broadband rotor noise — method to find level of high frequency broadband aircraft noise due to rotary wings
N80-14838
ROTATING BODIES
Magnus effect on spinning bodies of revolution
N80-14044
On the use of vibration self-damping materials in the manufacture of parts for rotating machinery
N80-14135
Temperature and pressure measurement techniques for an advanced turbine test facility
[NASA-TM-79278] N80-14374
Optimal rotating column
[CSIR-TWISK-76] N80-14401
ROTATING CYLINDERS
Hydraulic jumps in a partially filled rotating cylinder
[K/TS-2936] N80-14362
ROTOR AERODYNAMICS
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615] N80-14049
Acoustically swept rotor — helicopter noise reduction
[NASA-CASE-ARC-11106-1] N80-14107
RUNWAYS
Reflection cracking of bituminous overlays for airport pavements: A state of the art
[AD-A073484] N80-14144
Effect of weather conditions on airport operations
N80-14638
RURAL AREAS
Urban-rural insolation correlation study — air pollution over metropolitan St. Louis
[DOE/ET-0092] N80-14618
RUTHENIUM
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392

S

SADDLE POINTS [GAME THEORY]
Global saddle-point theorems involving conjugate-like operators, for general and quasi-concave programs
[CSIR-TWISK-72] N80-14811
SAFETY
Liquefied gaseous fuels safety and environmental control assessment program
[DOE/EV-0036] N80-14266
A study of fire safety effectiveness statements — buildings
[PB-299169/3] N80-14275
SAFETY MANAGEMENT
Fire-code inspections and fire prevention: What methods lead to success
[PB-298991/1] N80-14276
SATELLITE INSTRUMENTS
Monitor proportional counter
N80-14995
SATELLITE OBSERVATION
Satellite Remote Sensing: Applications in Agroclimatology and Agrometeorology
[ESA-SP-1020] N80-14440
The ESA remote sensing program: Present activities and future plans
N80-14449
Crop environment monitoring: The assessment of environmental phenomena using satellite remote sensing data
N80-14454
Satellite remote sensing in hazard monitoring and disaster evaluation
N80-14456
Satellite remote sensing for agricultural advisories and planning
N80-14457
Studies of interplanetary dust — study by satellite observation of interplanetary dust from micrometeoroids
N80-15006
SATELLITE ORBITS
Microcomputer-based on-line state estimation with applications to satellites
N80-14033
SATELLITE POWER TRANSMISSION [TO EARTH]
Satellite Power System [SPS]: An overview of prospective organizational structures in the solar satellite field
[TID-29094] N80-14478
SATELLITE SOLAR POWER STATIONS
Satellite Power System [SPS]: An overview of prospective organizational structures in the solar satellite field
[TID-29094] N80-14478
SATELLITE TRANSMISSION
Earth terminal subsystem study. Volume 1: Small terminal cost analysis — radio equipment
[AD-A073429] N80-14305
SATELLITE-BORNE INSTRUMENTS
Overview of remote sensing for agrilimatology and agrometeorology
N80-14442
SATURN [PLANET]
Pioneer 11 Saturn encounter mission support
N80-14154
Pioneer Saturn encounter news briefing
[NASA-TM-80353] N80-15009
SCATTERING COEFFICIENTS
Computation of the radiation characteristics of antennas on complicated structures in the high frequency case. Principle of the geometrical theory of diffraction
[ESA-TT-593] N80-14328
SCATTERING CROSS SECTIONS
Calculation of total cross sections for charge exchange in molecular collisions
[NASA-CR-162560] N80-14879
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420] N80-14920
The use of resonance epithermal neutron scattering for the study of condensed matter
N80-14936
SCHEDULING
A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14102
User requirements for a patient scheduling system
[NASA-CR-162539] N80-14956
SCHROEDINGER EQUATION
Classical theory of radiative transitions
N80-14285
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions
[IPPJ-417] N80-14930
SCINTILLATION COUNTERS
Hard X-ray observation of Cygnus-3
[MPI-PAE/EXTRATERREST-155] N80-15002
SCORING
FEI camera system, acceptance test and checkout procedure, as installed in BQM-34 A/S and BQM-34 E/T
[AD-A074388] N80-14378
SEA BREEZE
Sea breezes on the Alaskan arctic coast
N80-14632
SEA WATER
Volatile organic compounds in seawater — sources and transport mechanisms
[AD-A074179] N80-14214
Compendium of meteorology for use by class one and class two meteorological personnel. Volume 2, part 3: Marine meteorology
[WMO-364] N80-14660
SEALS [STOPPERS]
Feasibility of SiC composite structures for 1644 K [2500 F] gas turbine seal application
[NASA-CR-159597] N80-14122
Abradable compressor and turbine seals, volume I — for turbofan engines
[NASA-CR-159600] N80-14235
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073654] N80-14342
Surface conforming thermal/pressure seal — for control devices in space vehicles
[NASA-CASE-MSC-18422-1] N80-14400
Self-acting lift-pad geometry for circumferential seals: A noncontacting concept — performance tests on hydrodynamic seals
[NASA-TP-1583] N80-14403
SEARCH RADAR
A model for space radar clutter
[AD-A072990] N80-14302
SECONDARY RADAR
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Performance evaluation methods of a secondary radar network
N80-14068
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
Preliminary analysis and selection criteria for an antenna for a secondary radar system
N80-14091
L-band measurements in the air traffic channel to characterize secondary radar systems
N80-14092
Monopulse receiver performance in SSR and DABS systems
N80-14093
Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS]
N80-14097
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100
A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14102
Automatic systems for airport surface mobile media surveillance based on the use of secondary media
N80-14104
SECULAR VARIATIONS
Voyager 1979: Update to the radial and solar cycle variations in the solar wind phase fluctuation spectral index
N80-14160
SEISMIC ENERGY
Homomorphic processing of seismic signals
[LA-7876-MS] N80-14620
SEISMIC WAVES
The implication of Pn amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14606
Seismic discrimination — between earthquakes and underground nuclear explosions
[AD-A073772] N80-14614
United States earthquakes, 1977
[PB-300863/4] N80-14624
SEISMOGRAPHS
Studies with a small seismic array in eastcentral Minnesota
N80-14604
Homomorphic processing of seismic signals
[LA-7876-MS] N80-14620
SEISMOLOGY
Studies with a small seismic array in eastcentral Minnesota
N80-14604
Operation of a telemetered seismic network on the Alaska Peninsula
[DOE/ER-70006-6] N80-14619
SELECTION
Methodology for the evaluation of a radar site
N80-14067
SELF ABSORPTION
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074635] N80-14346
SELF FOCUSING
Simultaneous multiple camera and multiple focal setting self-calibration in photogrammetry
N80-14372
SEMICONDUCTING FILMS
Growth and characterization of epitaxial piezoelectric and semiconductor films
[AD-A073813] N80-14943
SEMICONDUCTOR JUNCTIONS
Optoelectronic properties of metal-tunnel oxide-silicon junctions
N80-14336
SEMICONDUCTORS [MATERIALS]
Microwave magnetoplasma effects in semiconductor powers and arrays of spheres
N80-14933
SENSORY STIMULATION
Effect of rhythmic photostimulation on monkeys with hyperkinesis of post-encephalitic genesis
[NASA-TM-75986] N80-14674
SEPARATED FLOW
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162530] N80-14052
High angle of attack characteristics of different fighter configurations
[MBB-UFE-1443[O]] N80-14058
Separated turbulent flow behind a stalled airfoil
[AAAF-NT-79-12] N80-14059
The calculation of inviscid separated flow about a slender cone for large angles of attack
[RAE-TR-2009] N80-14360

SEQUENCING
Radar data utilization in automating the sequencing of aircraft in terminal areas
N80-14071

SEQUENTIAL ANALYSIS
Optimal selection from a random sequence with observation errors — for the assessment of mineral rights or industrial equipment options
[CSIR-TWISK-49] N80-14829

SERIES EXPANSION
The decomposition of mixtures and classification using the gradient technique — an approach to pattern recognition
[PB94VG-PBWT-79-07] N80-14799
Comparison of regression, difference and ratio estimators in sample theory
[GMD-MITT-42] N80-14818

SET THEORY
Indicating cones and the intersection principle for tangential approximants in abstract multiplier rules
[CSIR-TWISK-68] N80-14810
On Bayes and gamma-minimax subset selection rules
N80-14823
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-81] N80-14828
Results and conjectures on covering metric spaces
[CSIR-TWISK-70] N80-14833

SEWAGE TREATMENT
Health effects of aerosols emitted from an activated sludge plant
[PB-299983/5] N80-14696

SHALE OIL
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
Energy from the West: Energy resource development systems report. Volume 3: Oil shale
[PB-299179/2] N80-14465
Surface water quality parameters for monitoring oil shale development
[PB-297904/7] N80-14470

SHALES
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423

SHAPES
Strong shape theory
N80-14802

SHEAR FLOW
Instability of gravity waves in a shear flow
N80-14607

SHEAR STRENGTH
Toward improved techniques for predicting soil strength in offshore environments
[PB-299960/5] N80-14625

SHOCK LOADS
X-ray diffraction studies of shocked lunar analogs
[NASA-CR-162555] N80-15011

SHOCK RESISTANCE
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341

SHOCK TESTS
X-ray diffraction studies of shocked lunar analogs
[NASA-CR-162555] N80-15011

SHOCK WAVE CONTROL
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532] N80-14124

SHOCK WAVE GENERATORS
Experiments to show the existence of the liquefaction shock wave in retrograde gases
[MPIS-MITT-67] N80-14367

SHOCK WAVE INTERACTION
Sonic-boom wave-front shapes and curvatures associated with maneuvering flight
[NASA-TP-1611] N80-14045

SHOCK WAVES
Low impedance manganin stress gauge system for severe shock wave environments
[UCRL-81605] N80-14379

SHORT HAUL AIRCRAFT
Quiet short-haul research aircraft familiarization document — STOL
[NASA-TM-81149] N80-14108
Quiet Clean Short-Haul Experimental Engine [QCSEE] acoustic and aerodynamic tests on a scale model over-the-wing thrust reverser and forward thrust nozzle
[NASA-CR-135254] N80-14115
Quiet Clean Short-Haul Experimental Engine [QCSEE]. Under-the-wing [UTW] engine boilerplate Nacelle test report. Volume 2: Aerodynamics and performance
[NASA-CR-135255] N80-14116
Quiet, Clean, Short-Haul, Experimental Engine [QCSEE] Under-The-Wing [UTW] engine acoustic design
[NASA-CR-135267] N80-14117
Quiet, Clean, Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] engine acoustic design
[NASA-CR-135268] N80-14118
Quiet Clean Short-Haul Experimental Engine [QCSEE] Under-The-Wing [UTW] graphite/EMR cowl development
[NASA-CR-135279] N80-14119
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556] N80-14121

SHORT TAKEOFF AIRCRAFT
Quiet short-haul research aircraft familiarization document — STOL
[NASA-TM-81149] N80-14108

SHRINKAGE
Palladium sintering: Shrinkage kinetics for a sponge powder
[SAND-78-8207] N80-14241

SHROUDED TURBINES
Abradable compressor and turbine seals, volume 1 — for turbofan engines
[NASA-CR-159468] N80-14235

SIDELOBE REDUCTION
A generalized sidelobe cancelling structure for adaptive arrays
[AD-A074099] N80-14319

SIDELOBES
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098

SIGNAL DETECTION
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
Discrete time detection of signals in dependent non-Gaussian noise
N80-14283
Measured performance of laser intensity subcarrier direct detection optical communication receivers
N80-14383

SIGNAL DETECTORS
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423

SIGNAL DISTORTION
Adaptive equalization of delay distorted signals
[REPT-13-78] N80-14326

SIGNAL GENERATORS
Local oscillator radiation from television receivers
[BBC-RD-1979/21] N80-14287

SIGNAL MIXING
Discrete time detection of signals in dependent non-Gaussian noise
N80-14283

SIGNAL PROCESSING
Digital array signal processing techniques applied to guidance and navigation
N80-14032
Digital signal processing techniques in a monopulse tracking radar
N80-14035
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability
[AD-A074947] N80-14171
A constant percentage bandwidth transform for acoustic signal processing
N80-14280
Zinc oxide on silicon surface acoustic wave convolvers and memory correlators
N80-14284
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
A new class of optical communication systems. 1: Experiment
[AD-A074313] N80-14316
Homeomorphic processing of seismic signals
[LA-7876-MS] N80-14620
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description
[ESA-CR(P)-678-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR(P)-678-VOL-3] N80-14783
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results
[ESA-CR(P)-1228-VOL-1] N80-14784
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description
[ESA-CR(P)-1228-VOL-2] N80-14785
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques
[ESA-CR(P)-1228-VOL-3] N80-14786
'PROCOPES'. [Conversational program for signal analysis]: Evolvement of an interpretative control language
[ESA-TT-581] N80-14788

SIGNAL TO NOISE RATIOS
Speech enhancement using a soft-decision maximum likelihood noise suppression filter
[AD-A074082] N80-14309

SILICON
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14474-1] N80-14229
Development of mullite substrates and containers
[NASA-CR-162543] N80-14485
Silicon materials outlook study for 1980-1985 calendar years
[NASA-CR-162541] N80-14492

SILICON ALLOYS
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4893] N80-14200
The role of phosphorus in the intergranular embrittlement of Fe-3Si
N80-14230

SILICON CARBIDES
Feasibility of SiC composite structures for 1644 K [2500 F] gas turbine seal application
[NASA-CR-159597] N80-14122

SILICONE RUBBER
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52688] N80-14253

SILVER
Effect of silver on the structure and properties of arsenic-trisulfide glass
N80-14247

SIMPLE HARMONIC MOTION
Propagation in acoustically absorbent materials
N80-14865

SIMULATORS
Aircraft fuel system simulator tests with antimisting kerosene [jet A fuel with FM-9 additive] — flammability tests
[AD-A073237] N80-14256

SINGLE CRYSTALS
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932
The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis
[AD-A073421] N80-14942

SINTERING
Palladium sintering: Shrinkage kinetics for a sponge powder
[SAND-78-8207] N80-14241
The improvement of refractory alloys through powder metallurgy involving sintering with spinning
[ONERA-RT-12/1931-MY] N80-14243

SIRIO SATELLITE
Comparison between the first physiometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite — to study rain structures affecting radio channels at millimetric wavelengths
N80-14089

SITES
Methodology for the evaluation of a radar site
N80-14067
Simulation approach for base-line energy-siting analysis
[CONF-790459-22] N80-14511

SIZE [DIMENSIONS]
Analytic modeling of aerosol size distribution
[NASA-CR-159170] N80-14815

SIZE DETERMINATION
Realistic sizing of residential solar heating and cooling systems
[COO-2858-14] N80-14569

SKIN [STRUCTURAL MEMBER]
Protective coatings for aircraft composites in nuclear environments
[AD-A074899] N80-14199
Surface hardening by laser skin melting
[AD-A074166] N80-14236

SKYLAB PROGRAM
Press conference on Skylab
[NASA-TM-80752] N80-14167
Torque equilibrium attitude control for Skylab reentry
[NASA-TM-78252] N80-14169

SLEEP DEPRIVATION
Sleep and body rhythm disturbance in long-range aviation. The problem and a search for relief
N80-14714

SLICING
Assessment of present state-of-the-art sawing technology of large diameter ingots for solar sheet material
[NASA-CR-162535] N80-14273

SOCIAL FACTORS
Quantification of syntactic information content in graphics used for social empirical research
N80-14428

Distribution and classification of local socio-economic impacts from energy development
[CONF-790481-1] N80-14954
SODIUM
Substructure and properties of sodium beta alumina solid electrolyte
[EPRI-FP-1056] N80-14224
SODIUM CHLORIDES
Basic energy properties of electrolytic solutions dewater
[LBL-7827] N80-14226
SOIL MAPPING
The agro-ecological zones project — agroclimatic and land suitability assessment for various crops N80-14445
SOIL MECHANICS
Toward improved techniques for predicting soil strength in offshore environments
[PB-299960/5] N80-14625
SOIL MOISTURE
The application of thermal infrared remote sensing data to soil moisture and evaporation determination N80-14447
SOILS
Evaluation of alternate vanadium compounds for use in fiberglass reinforced plastic soil surfacing
[AD-A074871] N80-14615
Toward improved techniques for predicting soil strength in offshore environments
[PB-299960/5] N80-14625
SOLAR ACTIVITY EFFECTS
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionosphere. Conference, Germany Jul. 1975
[REPT-55/1977] N80-14609
Unsolved problems of the upper atmosphere N80-14610
Sun-weather relationships: A branch of solar-terrestrial physics N80-14613
SOLAR ARRAYS
Assessment of present state-of-the-art sawing technology of large diameter ingots for solar sheet material
[NASA-CR-162535] N80-14273
Reactor for simulation and acceleration of solar ultraviolet damage
[NASA-CR-162533] N80-14405
Method for forming a solar array strip
[NASA-CASE-NPO-13652-3] N80-14474
Residential photovoltaic module and array requirements study, appendices
[NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study
[NASA-CR-162528] N80-14482
Development of an accelerated test design for predicting the service life of the solar array at Mead, Nebraska
[NASA-CR-162534] N80-14483
Environmental testing of block 3 solar cell modules. Part 1: Qualification testing of standard production modules
[NASA-CR-162547] N80-14489
Evaluation of solar photovoltaic arrays for use on marine aids to navigation
[AD-A074893] N80-14507
Ohio exposition center solar home project
[PB-298541/4] N80-14577
Interaction of high voltage surfaces with the space plasma — solar arrays
[NASA-CR-159731] N80-14923
SOLAR CELLS
Self-reconfiguring solar cell system
[NASA-CASE-LEW-12586-1] N80-14472
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-162542] N80-14486
Environmental testing of block 3 solar cell modules. Part 1: Qualification testing of standard production modules
[NASA-CR-162547] N80-14489
Fracture strength of silicon solar cells
[NASA-CR-162540] N80-14490
Photovoltaic incentives options
[HCP/CS-0023] N80-14561
Recent investigations of metal oxide/CdTe heterojunction solar cells
[CONF-780619-25] N80-14564
SOLAR COLLECTORS
Solar concentrator
[NASA-CASE-MFS-23727-1] N80-14473
Visualization of natural convection in flat plate solar collectors N80-14476
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector
[NASA-CR-161253] N80-14497
Results of thermal performance evaluation of the Owens-Illinois sunpack liquid solar collector at indoor conditions
[NASA-CR-161189] N80-14500
Non-tracking inflated cylindrical solar concentrator
[UCRL-82721] N80-14528
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
HELIOS and reconcentrator — computer program for simulation of solar collectors, concentrators, and heliostats
[SAND-78-1600C] N80-14557
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Realistic sizing of residential solar heating and cooling systems
[COO-2858-14] N80-14569
Ohio exposition center solar home project
[PB-298541/4] N80-14577
SOLAR COOLING
Development and testing of the Junkeeper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78244] N80-14495
Development and testing of the Rho Sigma Incorporated microprocessor control subsystem
[NASA-TM-78246] N80-14496
Development and testing of the Solar Control Corporation modular controller and Solarsat subsystem
[NASA-TM-78243] N80-14498
Engineering concerns in solar system design and operation
[SOLAR/0811-79/01] N80-14539
Evaluation of performance enhancement of solar powered absorption chiller with an improved control strategy using the BNL-built hardware simulator
[BNL-26218] N80-14552
Hazardous properties and environmental effects of materials used in Solar Heating and Cooling [SHAC] technologies: Interim handbook
[DOE/EV-0028] N80-14565
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Realistic sizing of residential solar heating and cooling systems
[COO-2858-14] N80-14569
SOLAR CYCLES
Voyager 1979: Update to the radial and solar cycle variations in the solar wind phase fluctuation spectral index N80-14160
SOLAR ECLIPSES
Unsolved problems of the upper atmosphere N80-14610
SOLAR ENERGY
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector
[NASA-CR-161253] N80-14497
Photosensitization mechanisms for energy storing isomerizations
[AD-A074968] N80-14502
Implementation of state solar incentives: Land-use planning to ensure solar access
[SERI/TR-51-163] N80-14519
Commercialization strategy report for small wind systems
[TID-28844-DRAFT] N80-14543
Commercialization strategy report for solar water heating
[TID-28856-DRAFT] N80-14545
A review of the economics of selected passive and hybrid systems — design concepts for solar energy utilization
[SERI/TP-61-144] N80-14547
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
The 10 MW solar thermal pilot plant dynamic simulation. Volume 1: Computer program description
[ATR-78(7747)-1-VOL-1] N80-14550
The 10 MW solar thermal pilot plant dynamic simulation. Volume 2: Computer program source listing
[ATR-78-(7747)-2-VOL-2] N80-14551
Engineers guide to solar energy
[PB-297043/2] N80-14574
Meteorology for Solar Energy Applications — conferences
[ISSN-0306-7874] N80-14631
SOLAR ENERGY ABSORBERS
Thermal aging characteristics of electrodeposited black chrome solar coatings
[SAND-78-2094C] N80-14527
Studies of directly absorbing fluids for mid-temperature solar thermal applications
[MLM-2625-OP] N80-14540
SOLAR ENERGY CONVERSION
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
Solar concentrator
[NASA-CASE-MFS-23727-1] N80-14473
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162544] N80-14484
Application of field-modulated generator systems to dispersed solar thermal electric generation
[NASA-CR-162536] N80-14488
Results of thermal performance evaluation of the Owens-Illinois sunpack liquid solar collector at indoor conditions
[NASA-CR-161189] N80-14500
Analysis of remote site energy storage and generation systems — systems analysis of solar energy conversion and windpower utilization energy storage systems
[AD-A074869] N80-14504
Application of diffusion research to solar energy policy issues
[SERI/TR-51-194] N80-14518
Implementation of state solar incentives: A preliminary assessment
[SERI/TR-51-159] N80-14520
Non-tracking inflated cylindrical solar concentrator
[UCRL-82721] N80-14528
Commercial solar augmented heat pump system
[EPRI-ER-1004] N80-14537
Systems Studies for Central Solar Thermal Electric
[CONF-780383] N80-14558
Electric utility solar energy activities, 1978
[EPRI-ER-966-SR] N80-14560
System tests and applications photovoltaic program
[HCP/T4034-01/15] N80-14566
Insolation models, data and algorithms
[SERI/TR-36-130] N80-14617
SOLAR FLARES
Solar-geophysical data number 412, December 1978. Part 1: Prompt reports, data for November 1978, October 1978
[PB-300877/8] N80-15019
Solar-geophysical data number 412, December 1978. Part 2: Comprehensive reports, data for June-May 1978, and miscellanea
[PB-300878/6] N80-15020
Solar-geophysical data number 419, July 1979. Part 1: Prompt reports, data for June 1979, May 1979
[PB-300836/4] N80-15021
Solar-geophysical data number 419, July 1979. Part 2: Comprehensive reports, data for January 1979, December 1978
[PB-300837/2] N80-15022
SOLAR GENERATORS
Application of field-modulated generator systems to dispersed solar thermal electric generation
[NASA-CR-162536] N80-14488
solar thermal power systems advanced solar thermal technology project, advanced subsystem development
[NASA-CR-162546] N80-14491
SOLAR HEATING
The solar in Federal buildings demonstration program
[PB-298535/6] N80-14279
Development and testing of the Junkeeper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78244] N80-14495
Development and testing of the Rho Sigma Incorporated microprocessor control subsystem
[NASA-TM-78246] N80-14496
Development and testing of the Solar Control Corporation modular controller and Solarsat subsystem
[NASA-TM-78243] N80-14498
Development, testing and certification of the sigma research, maxi-therm-S-101 thermosyphon heat exchanger
[NASA-TM-78245] N80-14499
Computer program for assessing the economic feasibility of solar energy for single family residences and light commercial applications
[NASA-TM-78251] N80-14501
Engineering concerns in solar system design and operation
[SOLAR/0811-79/01] N80-14539
Thermal energy storage for solar applications: An overview
[SERI/TP-34-089] N80-14546
Hazardous properties and environmental effects of materials used in Solar Heating and Cooling [SHAC] technologies: Interim handbook
[DOE/EV-0028] N80-14565
Performance of residential solar heating and cooling system with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Realistic sizing of residential solar heating and cooling systems
[COO-2858-14] N80-14569
Engineers guide to solar energy
[PB-297043/2] N80-14574
Commercializing solar heating: A national strategy needed
[PB-297882/3] N80-14575
SOLAR HOUSES
Computer program for assessing the economic feasibility of solar energy for single family residences and light commercial applications
[NASA-TM-78251] N80-14501
Ohio exposition center solar home project
[PB-298541/4] N80-14577
SOLAR PHYSICS
Solar-geophysical data number 412, December 1978. Part 1: Prompt reports, data for November 1978, October 1978
[PB-300877/8] N80-15019
Solar-geophysical data number 412, December 1978. Part 2: Comprehensive reports, data for June-May 1978, and miscellanea
[PB-300878/6] N80-15020

Solar-geophysical data number 419, July 1979. Part 1: Prompt reports, data for June 1979, May 1979 [PB-300836/4] N80-15021
Solar-geophysical data number 419, July 1979. Part 2: Comprehensive reports, data for January 1979, December 1978 [PB-300837/2] N80-15022
SOLAR PONDS [HEAT STORAGE]
Construction and initial operation of the Miamisburg salt-gradient solar pond [MLM-2626-OP] N80-14541
SOLAR POWER SATELLITES
Satellite Power System (SPS): An overview of prospective organizational structures in the solar satellite field [TID-29096] N80-14478
SOLAR RADIATION
Meteorology for Solar Energy Applications — conference [ISSN-0306-7874] N80-14631
SOLAR RADIO EMISSION
Solar-geophysical data number 412, December 1978. Part 1: Prompt reports, data for November 1978, October 1978 [PB-300877/8] N80-15019
Solar-geophysical data number 412, December 1978. Part 2: Comprehensive reports, data for June-May 1978, and miscellanea [PB-300878/6] N80-15020
Solar-geophysical data number 419, July 1979. Part 1: Prompt reports, data for June 1979, May 1979 [PB-300836/4] N80-15021
Solar-geophysical data number 419, July 1979. Part 2: Comprehensive reports, data for January 1979, December 1978 [PB-300837/2] N80-15022
SOLAR TERRESTRIAL INTERACTIONS
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionospheres. Conference, Germany Jul. 1975 [REPT-55/1977] N80-14609
Sun-weather relationships: A branch of solar-terrestrial physics N80-14613
SOLAR WIND
Voyager 1979: Update to the radial and solar cycle variations in the solar wind plasma fluctuation spectral index N80-14160
Polar ionosphere N80-14611
SOLENOIDS
Low temperature latching solenoid — cryogenic fluid storage and flow control [NASA-CASE-MSC-18106-1] N80-14338
SOLID ROCKET PROPELLANTS
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices [AD-A073680] N80-14261
SOLID STATE PHYSICS
Quantum field theory methods applied to the physics of condensed matter [AD-A073509] N80-14940
SOLID WASTES
Fast production of methane by anaerobic digestion, volume I — solid waste utilization [COO-2900-17-VOL-1] N80-14268
Survey of solidification/stabilization technology for hazardous industrial wastes [PB-299206/3] N80-14278
Commercialization strategy report for energy from urban wastes [TID-28852-DRAFT] N80-14521
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste [CONF-790373-1] N80-14562
SOLID-SOLID INTERFACES
Contact stress analysis of ceramic-to-metal interfaces — in gas turbine engines [AD-A074491] N80-14417
SOLIDIFICATION
Survey of solidification/stabilization technology for hazardous industrial wastes [PB-299206/3] N80-14278
SOLIDIFIED GASES
Vibrational spectra of solid ethane; vibrational spectra of diborane in an argon matrix N80-14203
SOLIDS
Some double resonance and multiple quantum NMR studies in solids — quantum mechanics study of nuclear magnetic resonance on line shape and spin resonance of solids [LBL-8042] N80-14883
SOLITARY WAVES
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions [IPPJ-417] N80-14910
SOLUBILITY
Methods for calculation of engineering parameters for gas separation — vapor pressure and solubility of gases in organic liquids [NASA-CR-162532] N80-14211
SOLUTIONS
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry [AD-A074026] N80-14216
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility N80-14930
SOLVENTS
Polystyrene in mixed solvents N80-14245
SONAR
Underwater sound scattering by marine organisms. A review — sonar interference [MRL-R-756] N80-14841
SONIC BOOMS
Sonic-boom wave-front shapes and curvatures associated with maneuvering flight [NASA-TP-1611] N80-14045
SOUND GENERATORS
Radiated noise due to boundary-layer transition [AD-A073491] N80-14846
Directivity of acoustic radiation from sources N80-14863
SOUND PRESSURE
Experimental measurements of moving noise sources N80-14868
SOUND PROPAGATION
Effects of friction and heat conduction on sound propagation in ducts — analyzing complex aerodynamic noise problems [NASA-CR-162556] N80-14842
The analysis of sound propagation in jet engine ducts using the finite difference method [AD-A074233] N80-14853
Measurement of sound velocity in liquid metals [UCID-18171] N80-14857
Fundamentals of sound reflection and refraction in inhomogeneous media — atmospheric propagation N80-14861
SOUND TRANSMISSION
Special Course on Acoustic Wave Propagation [AGARD-R-686] N80-14858
Propagation in acoustically absorbent materials N80-14865
Acoustic Energy N80-14866
Absorption of sound waves in the atmosphere N80-14867
SOUND WAVES
Optical probing of acoustic emission waves — acoustic measurement of acoustic emissions using piezoelectric transducers compared optical techniques of measurement [AD-A074160] N80-14854
A general survey of studies on acoustic wave propagation N80-14859
Propagation in ducts N80-14864
Applications of diffraction theory to aeroacoustics — aircraft noise N80-14870
Underwater acoustic problems N80-14872
Finite-amplitude wave propagation — acoustic propagation in nonlinear media N80-14874
Nonlinear interaction of finite-amplitude sound waves N80-14875
SOUNDING
Operating scenario for a Hydrographic Airborne Laser Sounder [HALS] [AD-A073872] N80-14390
Methods and programs to utilize satellite indirect soundings in environmental analysis and prediction [AD-A074772] N80-14654
SOUNDING ROCKETS
Rocket ozone sounding network data [NASA-TM-73283] N80-14608
SOUTHEAST ASIA
Navy combat search and rescue [AD-A074593] N80-14062
SPACE CHARGE
The current status of predictions of low energy plasma interactions with space systems — plasma interactions with spacecraft in orbit due to space charge and magnetosphere [AD-A074523] N80-14186
SPACE ELECTRIC ROCKET TESTS
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines [ONERA-RTS-1/3127-EY] N80-14195
SPACE EXPLORATION
Pioneer Saturn encounter news briefing [NASA-TM-80353] N80-15009
Future of planetary exploration — review of space exploration missions to study planets [NASA-TM-80352] N80-15010
SPACE FLIGHT
Flight Design System-1 System Design Document. Volume 9: Executive logic flow, program design language [NASA-TM-80841] N80-14180
SPACE FLIGHT STRESS
Recent advances in Aeronautical and Space Medicine [AGARD-CP-265] N80-14678
Physiological factors in space operations. Emphasis on space shuttle N80-14682
Simulation of physiological systems in order to evaluate and predict the human condition in a space flight [NASA-TM-76016] N80-14716
SPACE HEATING [BUILDINGS]
The solar in Federal buildings demonstration program [PB-298535/6] N80-14279
Development, testing and certification of the sigma research, maxi-therm-S-101 thermosyphon heat exchanger [NASA-TM-78245] N80-14499
Commercializing solar heating: A national strategy needed [PB-297882/3] N80-14575
SPACE INDUSTRIALIZATION
The Space Industrialization Act of 1979 [GPO-55-409] N80-14970
SPACE MAINTENANCE
Thermal protection system flight repair kit [NASA-CR-160417] N80-14176
Shuttle orbiter TPS flight repair kit development [NASA-CR-160416] N80-14179
Thermal protection system repair kit program [NASA-CR-160418] N80-14181
SPACE MISSIONS
Future of planetary exploration — review of space exploration missions to study planets [NASA-TM-80352] N80-15010
SPACE NAVIGATION
Research in navigation and optimization for space trajectories [NASA-CR-160420] N80-14164
SPACE PROGRAMS
Press briefing: MAGSAT — conference [NASA-TM-80757] N80-14168
Press conference: FY 1980 budget [F79-10182] N80-14968
The NASA FY 1980 budget [F79-10183] N80-14969
A review of NASA international programs [NASA-TM-80845] N80-14971
SPACE SHUTTLE ORBITERS
Altitude response of several airplanes during landing approach — including space shuttle [NASA-TM-80186] N80-14139
Press briefing on Dr. Frosch's meeting with President Carter regarding the space shuttle — conference [NASA-TM-80753] N80-14174
DOD STS ground support systems [VCR-76-032-05] N80-14178
Shuttle orbiter TPS flight repair kit development [NASA-CR-160416] N80-14179
SPACE SHUTTLE PAYLOADS
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation [NASA-TM-80136] N80-14163
SPACE SHUTTLES
Research in navigation and optimization for space trajectories [NASA-CR-160420] N80-14164
Press briefing on Dr. Frosch's meeting with President Carter regarding the space shuttle — conference [NASA-TM-80753] N80-14174
Software design specification. Part 2: Orbital Flight Test [OFT] detailed design specification. Volume 3: Applications. Book 2: System management [NASA-CR-160389] N80-14175
Space transportation system shuttle turnabout analysis report [NASA-TM-80840] N80-14177
Flight Design System-1 System Design Document. Volume 9: Executive logic flow, program design language [NASA-TM-80841] N80-14180
Physiological factors in space operations. Emphasis on space shuttle N80-14682
Regenerative CO2 removal for PLSS application [NASA-CR-160419] N80-14718
SPACE TRANSPORTATION SYSTEM
Space transportation system shuttle turnabout analysis report [NASA-TM-80840] N80-14177
DOD STS ground support systems [VCR-76-032-05] N80-14178
Coupling device for unoving vehicles [NASA-CASE-GSC-12322-1] N80-14398
SPACE TRANSPORTATION SYSTEM FLIGHTS
Software design specification. Part 2: Orbital Flight Test [OFT] detailed design specification. Volume 3: Applications. Book 2: System management [NASA-CR-160389] N80-14175
SPACE-TIME FUNCTIONS
Vacuum polarization in curved spacetime — stress tensor determination N80-14951
SPACEBORNE ASTRONOMY
HEAO Science Symposium [NASA-CP-2113] N80-14977

A-4 scientific results
N80-14985
X-ray emission from the region of gamma 195+5
N80-14986
Diffuse X-ray emission from Abell clusters
N80-14987
The HEAO-1 neutron star timing experiment
N80-14989
X-ray iron-line emission from the SN 185 remnant
N80-14990
Optical identification and spectroscopy of X-ray sources precisely positioned with A-3
N80-14991
A high energy astronomy overview
N80-14992
Nondispersive spectroscopy of celestial X-ray sources
N80-14993
High resolution X-ray spectroscopy on the Einstein Observatory
N80-14994
Monitor proportional counter
N80-14995
Einstein observations of active galaxies and quasars
N80-14997
The structure and evolution of X-ray clusters of galaxies
N80-14998
Columbia/Einstein observations of galactic X-ray sources
[CONTRIB-179] N80-14999
Columbia/Einstein observations of extragalactic X-ray sources
[CONTRIB-180] N80-15000

SPACEBORNE TELESCOPES
Einstein observations of extended galactic X-ray sources
N80-14996

SPACECRAFT ANTENNAS
Antenna deployment mechanism for use with a spacecraft — extensible and retractable telescopic antenna mast
[NASA-CASE-GSC-12331-1] N80-14183

SPACECRAFT CHARGING
ATS-5 and ATS-6 potentials during eclipse
[AD-A074878] N80-14170

SPACECRAFT COMPONENTS
Surface conforming thermal/pressure seal — for control devices in space vehicles
[NASA-CASE-MSC-18422-1] N80-14400

SPACECRAFT CONSTRUCTION MATERIALS
Guidelines for space materials selection
[ESA-PSS-07/QRM-01-ISSUE-5] N80-14187

SPACECRAFT DESIGN
Guidelines for space materials selection
[ESA-PSS-07/QRM-01-ISSUE-5] N80-14187

SPACECRAFT ENVIRONMENTS
Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
[ESA-BR-01] N80-14677
Biological systems for human life support: Review of the research in the USSR
[NASA-TM-76018] N80-14717

SPACECRAFT LAUNCHING
A review of NASA international programs
[NASA-TM-80845] N80-14971

SPACECRAFT MOTION
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation
[NASA-TM-80136] N80-14163

SPACECRAFT ORBITS
The current status of predictions of low energy plasma interactions with space systems — plasma interactions with spacecrafts in orbit due to space charge and magnetosphere
[AD-A074523] N80-14186

SPACECRAFT PROPULSION
Assessment of in situ diagnostics for application to rocket propulsion problems
[AD-A073520] N80-14190
Missions and planning for nuclear space power
[LA-UR-79-1240] N80-14893

SPACECRAFT RADIATORS
Meteoroid protection methods for spacecraft radiators using heat pipes
[NASA-CR-162545] N80-14185

SPACECRAFT REENTRY
Press conference on Skylab
[NASA-TM-80752] N80-14167
Torque equilibrium attitude control for Skylab reentry
[NASA-TM-78252] N80-14169

SPACECRAFT SHIELDING
Meteoroid protection methods for spacecraft radiators using heat pipes
[NASA-CR-162545] N80-14185

SPACECRAFT TRACKING
The Deep Space Network
[NASA-CR-162524] N80-14150
Voyager mission support
N80-14153

SPACECREWS
The European approach to the selection and training of SL payload specialists
N80-14681

SPACELAB
Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
[ESA-BR-01] N80-14677

SPACELAB PAYLOADS
The European approach to the selection and training of SL payload specialists
N80-14681

SPALLATION
Galileo probe thermal protection: Entry heating environments and spallation experiments design
[NASA-CR-152334] N80-14184

SPATIAL DISTRIBUTION
Air traffic density and distribution measurements
[AD-A073229] N80-14064
Spatial data management system
[AD-A068863] N80-14964

SPATIAL FILTERING
Digital array signal processing techniques applied to guidance and navigation
N80-14032

SPECIFIC HEAT
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159166] N80-14197
Heat capacity of amorphous and disordered Nb3Ge thin films
N80-14931
Ordering transitions in helium-4 submonolayers: A heat capacity study
N80-14934

SPECIFICATIONS
Guidelines for space materials selection
[ESA-PSS-07/QRM-01-ISSUE-5] N80-14187
Functional design specification: NASA form 1510
[NASA-CR-162513] N80-14955

SPECKLE PATTERNS
A new class of optical communication systems. 1: Experiment
[AD-A074313] N80-14316
Analysis of techniques for imaging through the atmosphere — speckle imagery for deep space object identification
[AD-A073640] N80-14901
Speckle interferometry for a partially coherent source
[AD-A074540] N80-15004

SPECTRAL CORRELATION
Spectral estimation from irregular arrays
[PB-299363/2] N80-14831

SPECTRAL EMISSION
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159166] N80-14197

SPECTRAL ENERGY DISTRIBUTION
Gamma energy spectra for the RADC/ES cobalt 60 source
[AD-A073557] N80-14891

SPECTRAL RECONNAISSANCE
Physical background of remote sensing — multispectral reconnaissance of the Earth surface
N80-14443
The application of thermal infrared remote sensing data to soil moisture and evaporation determination
N80-14447

SPECTRAL SIGNATURES
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
Physical background of remote sensing — multispectral reconnaissance of the Earth surface
N80-14443
Clustering algorithm evaluation and the development of a replacement for procedure 1 — for crop inventories
[NASA-CR-160424] N80-14772
Infrared measurements of vehicles and weapons
[AD-A074487] N80-14905

SPECTROMETERS
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
High resolution magnetic spectrometer for antiproton physics at rest and low energies
[BNL-24662] N80-14890

SPECTROSCOPIC ANALYSIS
Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206
Two photon spectroscopy of pyrazine and triazine
[AD-A074055] N80-14219
Electron spin echo spectroscopy and photosynthesis
[CONF-780741-4] N80-14228

SPECTROSCOPY
The kinetics and spectroscopy of aircraft and rocket plume constituents
[AD-A074220] N80-14222
Laser time-resolved site selections spectroscopy of Nd3+ ions in mixed garnet crystals
N80-14938

SPECTRUM ANALYSIS
The 0.1 wavenumber spectral measurements in the region from 2050 - 2410 wavenumbers of a static, experimental rocket motor at three pressure altitudes
[AD-A073704] N80-14191
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
Ultrasonic flaw detection and characterization in structural materials by spectral analysis
[ORNL/TM-6456] N80-14408
Clustering algorithm evaluation and the development of a replacement for procedure 1 — for crop inventories
[NASA-CR-160424] N80-14772

SPEECH
Subband coder study
[AD-A074427] N80-14312
Speech patterns and aircrew workload
N80-14754

SPEECH RECOGNITION
Vocabulary specification for automatic speech recognition in aircraft cockpits
[AD-A073703] N80-14303
Speech enhancement using a soft-decision maximum likelihood noise suppression filter
[AD-A074082] N80-14309
Speech compression and synthesis — vocoders
[AD-A074497] N80-14315

SPEED CONTROL
Automation of flight on-line strategic control: The case of speed control on pre-established routes
N80-14070

SPIN EXCHANGE
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency
[NASA-CR-162525] N80-14879

SPIN RESONANCE
Some double resonance and multiple quantum NMR studies in solids — quantum mechanics study of nuclear magnetic resonance on line shape and spin resonance of solids
[LBL-8042] N80-14883

SPIN STABILIZATION
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability
[AD-A074947] N80-14171

SPINAL CORD
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization
[NASA-TM-75983] N80-14672

SPREAD F
An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique — experiment planning
[MPI-PAE/EXTRATERREST-152] N80-14621

SPREAD SPECTRUM TRANSMISSION
Techniques and benefits of shaping the pulses of binary sequences with application to spread spectrum radio communications
[AD-A073964] N80-14322

SPRINGS (ELASTIC)
Characteristics of disc springs in combination [to be used in conjunction with item no. 78043]
[ESDU-79010] N80-14396

SPUTTERING
The ionization and neutralization of sputtered atoms — study of surface ionization and dependence of sputtered atoms on energy distribution
N80-14939

STABILITY
Stability of the multimegabit telemetry carrier loop
N80-14155

STABILITY AUGMENTATION
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment — digital simulation
[NASA-TM-80136] N80-14163

STABILITY DERIVATIVES
Altitude response of several airplanes during landing approach — including space shuttle
[NASA-TM-80196] N80-14139

STAGNATION FLOW
On the question of instabilities upstream of cylindrical bodies
[NASA-CR-3231] N80-14357
Mass flow rate measurements in two-phase mixtures with stagnation probes
[CONF-790655-1] N80-14363

STAGNATION POINT
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074835] N80-14146

STAINLESS STEELS
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining-steels
N80-14231
Estimating structural integrity of Type 304 stainless steel plates and pipes containing small defects
[CONF-790802-11] N80-14238
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240
Materials studies for magnetic fusion energy applications at low temperatures-II
[PB-299288/1] N80-14244

Ultrasonic flaw detection and characterization in structural materials by spectral analysis
[ORNL/TM-6456] N80-14408
STANDARD DEVIATION
A new test for multivariate normality and homoscedasticity
[CSIR-TWISK-45] N80-14808
STANDARDS
A study of fire safety effectiveness statements — buildings
[PB-299109/3] N80-14275
Fire-code inspection and fire prevention: What methods lead to success
[PB-299991/1] N80-14276
S + S/X band coherent transponder specification
[ESA-PSS-40[TTC.C.10].ISSUE.1] N80-14327
Derivation of prototypic and Noise Induced Permanent Threshold Shift [NIPTS] to be used for the basis of a standard on the effects of noise on hearing
[AD-A071338] N80-14680
STATIC FIRING
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556] N80-14121
STATIC STABILITY
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability — F-16
[NASA-TP-1538] N80-14136
STATISTICAL ANALYSIS
A statistical analysis of extreme chinooks in Montana as they relate to large scale circulation changes
N80-14630
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 2: Analysis methods and preliminary results
[ESA-CR[P]-1228-VOL-1] N80-14784
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques
[ESA-CR[P]-1228-VOL-3] N80-14786
Spectral estimation from irregular arrays
[PB-299363/2] N80-14831
STATISTICAL DECISION THEORY
Validation and error in multiplicative utility functions
[AD-A073362] N80-14698
A criterion validation of multiattribute utility analysis and of a group communication strategy
[AD-A073364] N80-14699
Importance weight assessment for additive, riskless preference functions: A review
[AD-A073365] N80-14700
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
STATISTICAL DISTRIBUTIONS
Analytic modeling of aerosol size distributions
[NASA-CR-159170] N80-14815
STATISTICAL MECHANICS
Statistical mechanics and field theory
[LBL-9168] N80-14952
STATISTICAL TESTS
Randomization procedures for a two way analysis of orientation data — directional orientation in animals
N80-14824
STEAM
Development of the steam-iron process for hydrogen production, 9010
[PE-2435-32] N80-14258
STEELS
Energy conservation in the US economy from increased recycle of obsolete steel scrap
[COO-2893-10] N80-14524
STELLAR ENVELOPES
A study of P Cygni stars — model envelopes of early b-type
N80-15001
STELLAR MASS
The HEAO-1 neutron star timing experiment
N80-14989
STELLAR MODELS
A study of P Cygni stars — model envelopes of early b-type
N80-15001
STELLAR RADIATION
X-ray variability observed with HEAO A-1
N80-14978
Possible radio emission mechanism for pulsars
[NASA-TM-75715] N80-15023
STEREOPHOTOGRAPHY
A microprocessor-based random-dot stereogram system — for basic research and clinical testing
N80-14768
STOCHASTIC PROCESSES
A simple procedure for simulation of homogeneous Markhov chains on a computer
[ESA-TT-529] N80-14787
Workshop on Adaptive Control
[AD-A072723] N80-14796
Computation of moments of functionals of a solution to a stochastic differential equation
[CSIR-TWISK-73] N80-14813
STOICHIOMETRY
Laboratory measurements — for use in stratospheric modelling
N80-14642
Influence of stoichiometry on impingement erosion of lead sulfide and zinc selenide
[AD-A073955] N80-14946
STORAGE BATTERIES
Substructure and properties of sodium beta alumina solid electrolytes
[EPRI-FP-1056] N80-14224
Lithium/metal sulfide battery development
[CONF-790530-10] N80-14530
Advanced batteries for electric vehicles: A look at the future
[CONF-790494-1] N80-14531
STORM DAMAGE
Satellite remote sensing in hazard monitoring and disaster evaluation
N80-14456
STORMS [METEOROLOGY]
A utilization of the nested grid approach in the development of a severe weather index
N80-14627
The design of meteorological field experiments with applications to the mesoscale — sensor placement for severe storm sampling
N80-14629
STRAIN GAGES
The development of improved normal stress transducers for propellant grains, volume I
[AD-A073659] N80-14260
Triaxial measurement of stress waves in the free-field
[SAND-78-2123C] N80-14420
STRAPDOWN INERTIAL GUIDANCE
A redundant inertial navigation system for IUS
N80-14029
Development of aiding GPS/strapdown inertial navigation system
N80-14031
Methods for strap-down attitude estimation and navigation with accelerometers
N80-14034
STRATOSPHERE
Rocket ozone sounding network data
[NASA-TM-73283] N80-14408
The stratosphere: Present and future
[NASA-RP-1049] N80-14641
Laboratory measurements — for use in stratospheric modelling
N80-14642
Models — for the stratosphere
N80-14643
Budgets — in determining the physical and chemical state of the stratosphere
N80-14644
Radicals, reservoirs, and ions — important to stratospheric ozone photochemistry
N80-14645
Meteorology of the stratosphere
N80-14646
Long period changes in stratospheric parameters
N80-14647
Model predictions — for ozone concentration changes in the atmosphere
N80-14648
STRESS [PHYSIOLOGY]
Micromorphology of neurohypophysis of rats under experimental conditions
[NASA-TM-75947] N80-14671
Supersonic aerial transport: Medical and physiological aspects — Concorde aircraft
N80-14683
Three instruments for assessment of WBGT and a comparison with WGT [BOTSBALL]
[AD-A074979] N80-14691
Extended analysis of small group performance and the effects of contingency management in a programed environment
[AD-A068665] N80-14705
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress
N80-14740
Concepts of fatigue — survey of studies on pilot performance and flight fatigue discussed in terms of physiological and psychological stress
N80-14741
Concepts of stress
N80-14742
STRESS [PSYCHOLOGY]
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress
N80-14740
Concepts of fatigue — survey of studies on pilot performance and flight fatigue discussed in terms of physiological and psychological stress
N80-14741
Concepts of stress
N80-14742
Handling qualities, workload and heart rate
N80-14750
Pupillometric methods of workload evaluation: Present status and future possibilities — pilot workload
N80-14752
Speech patterns and aircrew workload
N80-14754
An exploratory study of psychophysiological measurements as indicators of air traffic control sector workload
N80-14755
Individual and system performance indices for the air traffic control system
N80-14756
Workload and stress in air traffic controllers
N80-14757
Assessment correlates of workload and performance
N80-14758
STRESS ANALYSIS
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices
[AD-A073660] N80-14261
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073654] N80-14342
Unified formalism of strain and stress
[CSIR-TWISK-77] N80-14414
Contact stress analysis of ceramic-to-metal interfaces — in gas turbine engines
[AD-A074491] N80-14417
Photoacoustic stress
[UCRL-82594] N80-14419
STRESS CONCENTRATION
Complete stress-strain curve of concrete and nonlinear design
[PB-299151/1] N80-14277
STRESS CORROSION CRACKING
Iodine stress-corrosion cracking in irradiated Zircaloy cladding
[CONF-790441-7] N80-14237
STRESS CYCLES
Cumulative damage under two level cycling, some theoretical predictions and test data
[AD-A074488] N80-14418
STRESS MEASUREMENT
The development of improved normal stress transducers for propellant grains, volume I
[AD-A073659] N80-14260
STRESS TENSORS
Vacuum polarization in curved spacetime — stress tensor determination
N80-14951
STRESS-STRAIN DIAGRAMS
Triaxial measurement of stress waves in the free-field
[SAND-78-2123C] N80-14420
Review of investigations into aeroacoustics related fatigue Federal Republic of Germany
[LBF-S-142] N80-14422
STRESS-STRAIN RELATIONSHIPS
Unified formalism of strain and stress
[CSIR-TWISK-77] N80-14414
STRETCHING
Stretching the circular cylindrical elastic sheet
N80-14800
STRUCTURAL ANALYSIS
Off-center, low velocity, transverse normal impact of a simply supported plate
[AD-A074946] N80-14416
Catalysis and surface science — study of relationship of atomic structure and catalysis during surface reactions
[LBL-9043] N80-14885
Grain boundary structure and properties
[COO-5002-3] N80-14947
STRUCTURAL DESIGN
Non-tracking inflated cylindrical solar concentrator
[UCRL-82721] N80-14528
A review of the economics of selected passive and hybrid systems — design concepts for solar energy utilization
[SERI/TP-61-144] N80-14547
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
STRUCTURAL DESIGN CRITERIA
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop — methodology for structural design criteria for time temperature functions for creep rupture strength
[EPRI-FP-1062-VOL-1] N80-14833
STRUCTURAL ENGINEERING
Fracture strength of silicon solar cells
[NASA-CR-162540] N80-14490
Fifth Ocean Thermal Energy Conversion Conference, volume 3, sections 6-7
[CONF-780236-P3] N80-14554
Fifth Ocean Thermal Energy Conversion Conference, volume 1, sections 1-3
[CONF-780236-P1] N80-14555
STRUCTURAL STABILITY
Evaluation of potential chemical/mechanical degradation processes affecting fuel and structural materials under long-term water storage
[NUREG-CR-0668] N80-14223
SUBROUTINES
SPAR thermal analysis processors reference manual, system level 16. Volume 1: Program execution
[NASA-CR-159162] N80-14212
FORTRAN subroutines for out-of-core solutions of large complex linear systems
[NASA-CR-159142] N80-14773

Automated numerical integration over a triangle
[CSIR-TWISK-78] N80-14405
SUBSONIC FLOW
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3210] N80-14047
SUBSONIC SPEED
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159198] N80-14054
SULFATES
Raman and infrared spectroscopy of aqueous corrosion films on lead in 0.1 M sulfate solutions
[AD-A074567] N80-14220
Sulfate and nitrate collected by filter sampling near the tropopause
[NASA-TP-1567] N80-14581
SULFIDES
Effect of silver on the structure and properties of arsenic-trisulfide glass
N80-14247
Review of industrial participation on the ANL lithium/iron sulfide battery development program — for energy storage and electric vehicles
[CONF-780832-1] N80-14573
SULFUR
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining steels
N80-14231
A box model study for global and regional sulfur circulations
N80-14580
SULFUR DIOXIDES
Accuracy of remotely sensed SO2 mass emission rates
[PB-298077/9] N80-14594
SULFUR FLUORIDES
An electron diffraction study of laser excited sulfur hexafluoride
N80-14207
SULFURIC ACID
Potential heat exchange fluids for use in sulfuric acid vaporizers
[NASA-CR-162548] N80-14358
SUNSPOT CYCLE
Unsolved problems of the upper atmosphere
N80-14610
SUPERCHARGERS
Supercharged topping rocket propellant feed system
[NASA-CASE-XLE-02062-1] N80-14188
SUPERCONDUCTING MAGNETS
Superconducting magnetic energy storage for electric power system dynamic stabilization
[LA-UR-79-1220] N80-14535
Superconducting magnets in high energy physics
[BNL-24818] N80-14897
SUPERCONDUCTING POWER TRANSMISSION
Wave propagation in a dc superconducting cable. Part 1: Analysis
[LA-UR-79-226] N80-14346
SUPERNOVA REMNANTS
X-ray iron-line emission from the SN 185 remnant
N80-14990
Einstein observations of extended galactic X-ray sources
N80-14996
Columbia/Einstein observations of galactic X-ray sources
[CONTRIB-179] N80-14999
SUPERNOVAE
Plasma physics of trapping of cosmic rays around supernova
[PPPL-1558] N80-15024
SUPERSONIC FLIGHT
Supersonic aerial transport: Medical and physiological aspects — Concorde aircraft
N80-14683
SUPERSONIC INLETS
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-value controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531] N80-14123
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532] N80-14124
Development of a three-dimensional supersonic inlet flow analysis
[NASA-CR-3218] N80-14356
SUPPORTS
The CF6 jet engine performance improvement: New front mount
[NASA-CR-159639] N80-14127
SURFACE ACOUSTIC WAVE DEVICES
Zinc oxide on silicon surface acoustic wave convolvers and memory correlators
N80-14284
SURFACE DEFECTS
A study of surface zone deterioration of nickel leading to fatigue crack initiation in low cycle fatigue
N80-14412
SURFACE ENERGY
Interaction of high voltage surfaces with the space plasma — solar arrays
[NASA-CR-159731] N80-14923
The ionization and neutralization of sputtered atoms — study of surface ionization and dependence of sputtered atoms on energy distribution
N80-14939
SURFACE FINISHING
Surface hardening by laser skin melting
[AD-A074166] N80-14236
SURFACE IONIZATION
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728] N80-14227
The ionization and neutralization of sputtered atoms — study of surface ionization and dependence of sputtered atoms on energy distribution
N80-14939
SURFACE NAVIGATION
Evaluation of solar photovoltaic arrays for use on marine aids to navigation
[AD-A074893] N80-14507
SURFACE PROPERTIES
Ground-wave propagation in a realistic terrain
[IRSC-RD-1979/19] N80-14286
Displacement probes with self-contained exciting medium
[NASA-CASE-LAR-11690-1] N80-14371
Apparatus for electrolytically tapered or contoured cavities
[NASA-CASE-XNP-08835-1] N80-14395
SURFACE REACTIONS
Photoemission studies of time-resolved surface reactions: Isothermal desorption of CO from Ni(3
[AD-A074953] N80-14221
Preliminary study of some graphite electrode surfaces responsive to iron and heavy metals by single-sweep voltammetry
[AD-A074605] N80-14343
Catalysis and surface science — study of relationship of atomic structure and catalysis during surface reactions
[LBL-9043] N80-14885
Interaction of high voltage surfaces with the space plasma — solar arrays
[NASA-CR-159731] N80-14923
SURFACE TEMPERATURE
A study of the relationship between oceanic chemical constituents and sea surface thermal structure as detected by satellite infrared imagery
[AD-A074186] N80-14663
SURFACE TO SURFACE MISSILES
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability
[AD-A074947] N80-14171
SURFACE VEHICLES
Infrared measurements of vehicles and weapons
[AD-A074487] N80-14905
SURFACE WAVES
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819
A monolithic surface acoustic wave charge transfer device
N80-14837
SURGERY
Intra-ocular pressure normalization technique and equipment
[NASA-CASE-LEW-12955-1] N80-14684
SURVEILLANCE
Monopulse receiver performance in SSR and DABS systems
N80-14093
SURVEILLANCE RADAR
On radar in air traffic control — conference, Rome, Jul. 1979
[FUB-11-1979] N80-14065
Problems related to the design and construction of a radar network
N80-14066
Methodology for the evaluation of a radar site
N80-14067
Performance evaluation methods of a secondary radar network
N80-14068
Organization of an integrated global maintenance service — Radar Networks
N80-14069
Simulation of a surveillance and control system of surface traffic in an airport
N80-14073
Tracking algorithms for mono and multiradar
N80-14074
Filtering of synthetic radar data
N80-14076
Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086
Development trends of airport surface traffic control radar
N80-14087
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS]
N80-14097
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14103
Automatic systems for airport surface mobile media surveillance based on the use of secondary media
N80-14104
Time simulation of an air surveillance task with varying amounts of radar information
[AD-A074866] N80-14722
SURVEYS
Operating scenario for a Hydrographic Airborne Laser Sounder [HALS]
[AD-A073472] N80-14390
SURVIVAL EQUIPMENT
Aeroacoustical systems technology needs: Escape, rescue and survival
[AD-A074906] N80-14061
SWEAT COOLING
Performance of a transpiration-regenerative cooled rocket thrust chamber
[NASA-CR-159742] N80-14189
SWEEP EFFECT
Acoustically swept rotor — helicopter noise reduction
[NASA-CASE-ARC-11106-1] N80-14107
SWITCHING CIRCUITS
Self-reconfiguring solar cell system
[NASA-CASE-LEW-12586-1] N80-14472
SYMBOLS
Quantification of syntactic information content in graphics used for social empirical research
N80-14428
SYNCHRONISM
Synchronization of clocks in the 100 ps range
[ESA-TT-578] N80-14381
A communication problem in a computer network
[REPT-272] N80-14793
SYNTAX
Quantification of syntactic information content in graphics used for social empirical research
N80-14428
SYNTHETIC APERTURE RADAR
Image transmission via spread spectrum techniques — synthetic aperture radar
[AD-A074606] N80-14308
SYNTHETIC FIBERS
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14201
SYNTHETIC FUELS
Pilot plant gasification test on biomass fuels
[PB-299077/8] N80-14272
SYSTEM FAILURES
Failure detection, isolation and indication in highly integrated digital guidance and control system
N80-14027
SYSTEMS ANALYSIS
A high accuracy flight profile determining system — systems analysis of inertial navigation system for aircraft position determination
N80-14042
Integration of flight and fire control — systems analysis of digital controlled integrated flight and fire control systems
N80-14043
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom
[NASA-TM-80153] N80-14055
Linear systems analysis program, L224[QR]. Volume 1: Engineering and usage
[NASA-CR-2861] N80-14137
Satellite Power System [SPS]: An overview of prospective organizational structures in the solar satellite field
[TID-29094] N80-14478
Analysis of remote site energy storage and generation systems — systems analysis of solar energy con-

version and windpower utilization energy storage system
[AD-A074909] N80-14304
Energy analysis of the basic materials utilized in electric power transmission systems
[HCP/T3943-01] N80-14310
Wind tunnel test of a full-scale helicostat
[SAND-79-8034] N80-14536
On-board multispectral classification study
[NASA-CR-3134] N80-14760
User requirements for a patient scheduling system
[NASA-CR-162539] N80-14956
SYSTEMS ENGINEERING
A distributed processing system for radar data presentation
N80-14075
Development trends of airport surface traffic control radar
N80-14087
Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase 1
[NASA-CR-159453] N80-14182
High-BTU coal gasification processes
[ANL/CES/TE-79-2] N80-14263
General considerations about circular waveguide systems
N80-14293
AFOSR Workshop in Communication Theory and Applications
[AD-A074298] N80-14313
Charge-coupled device architectures for signal processing
N80-14334
solar thermal power systems advanced solar thermal technology project, advanced subsystems development
[NASA-CR-162546] N80-14491
Engineering concerns in solar system design and operation
[SOLAR/0811-79/01] N80-14539
Wind tunnel test of a full-scale helicostat
[SAND-79-8034] N80-14536
Ohio exposition center solar home project
[PB-298541/4] N80-14577
Comparison of high speed printer interface characteristics
[PB-298943/2] N80-14767
A microprocessor-based random-dot stereogram system — for basic research and clinical testing
N80-14768
Simulation and real-time system design: An integrated approach
N80-14795
SYSTEMS MANAGEMENT
Network functions and facilities
N80-14151
Software design specification. Part 2: Orbital Flight Test [OFT] detailed design specification. Volume 3: Applications. Book 2: System management
[NASA-CR-160389] N80-14173
SYSTEMS STABILITY
Superconducting magnetic energy storage for electric power system dynamic stabilization
[LA-UR-79-1220] N80-14535

T

T-28 AIRCRAFT
The T-28 thunder/hailstorm penetration aircraft
N80-14640
TABLES [DATA]
Solar-geophysical data number 412, December 1978. Part 1: Prompt reports, data for November 1978, October 1978
[PB-300877/8] N80-15019
Solar-geophysical data number 412, December 1978. Part 2: Comprehensive reports, data for June-May 1978, and miscellanea
[PB-300878/6] N80-15020
Solar-geophysical data number 419, July 1979. Part 1: Prompt reports, data for June 1979, May 1979
[PB-300836/4] N80-15021
Solar-geophysical data number 419, July 1979. Part 2: Comprehensive reports, data for January 1979, December 1978
[PB-300837/2] N80-15022
TANGENTS
Indicating cones and the intersection principle for tangential approximants in abstract multiplier rules
[CSIR-TWISK-69] N80-14810
TANKS [COMBAT VEHICLES]
Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF
[MRL-R-752] N80-14233
TANTALUM
Scalable standard optical sources in the VUV: Emissions from electron impact on metals — tantalum and tungsten
[NASA-CR-162562] N80-14900
TARGET ACQUISITION
TMR processing procedures for GSRS spin and attitude measurements — study of the use of target acquisition missile tracking of surface to surface missiles for spin and attitude stability
[AD-A076947] N80-14171
FEI camera system, acceptance test and checkout procedure, as installed in BQM-34 A/S and BQM-34 E/T
[AD-A074388] N80-14371
Process model of how the human operator tracks discontinuous inputs
[AD-A069001] N80-14712
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-01] N80-14821
TARGET DRONE AIRCRAFT
Target missile airframe costs
[AD-A073314] N80-14112
TARGET RECOGNITION
Passive infrared surveillance - new methods of analysis
[AD-A074742] N80-14904
TECHNOLOGICAL FORECASTING
Aeronautical systems technology needs: Escape, rescue and survival
[AD-A074906] N80-14061
Silicon materials outlook study for 1980-1985 calendar years
[NASA-CR-162541] N80-14492
Advanced batteries for electric vehicles: A look at the future
[CONF-790684-1] N80-14531
TECHNOLOGY ASSESSMENT
Assessment of present state-of-the-art sawing technology of large diameter ingots for solar sheet material
[NASA-CR-162535] N80-14273
Low temperature lubrication
[STC-78/376] N80-14404
Review of investigations into aeroacoustics related fatigue Federal Republic of Germany
[LBF-S-142] N80-14422
Crop environment monitoring: The remote sensing system
N80-14452
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790373-1] N80-14562
Meteorology of the stratosphere
N80-14646
Severe storms research — congressional reports
[GPO-52-135] N80-14650
US aircrew chemical defense assemblies
N80-14736
Assessment of the applicability of mechanical energy storage devices to electric and hybrid vehicles. Volume 1: Executive summary
[UCRL-52773-VOL-1] N80-14973
A high energy astronomy overview
N80-14992
TECHNOLOGY TRANSFER
Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF
[MRL-R-752] N80-14233
Piping and tubing technology: A compilation
[NASA-SP-5903(01)] N80-14402
TECHNOLOGY UTILIZATION
Piping and tubing technology: A compilation
[NASA-SP-5903(01)] N80-14402
Overview of remote sensing for agriclimatology and agrometeorology
N80-14442
Satellite remote sensing for agricultural advisories and planning
N80-14457
Fuel cell option
[CONF-7809137-1] N80-14523
Applications of fuel cells in transportation
[LA-UR-79-628] N80-14526
A review of the economics of selected passive and hybrid systems — design concepts for solar energy utilization
[SERI/TP-61-144] N80-14547
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
TECTONICS
Operation of a telemetered seismic network on the Alaska Peninsula
[DOE/ER-70006-6] N80-14619
TELECOMMUNICATION
Research on circular waveguide communication systems
[FUB-28] N80-14291
Italian research on millimetric waveguide systems
N80-14292
General criteria for the design of repeating stations of circular waveguide systems
N80-14296
A network graphical conferencing system
[AD-A074610] N80-14779
TELECONFERENCING
A network graphical conferencing system
[AD-A074610] N80-14779
TELEMETRY
Stability of the multimegabit telemetry carrier loop
N80-14155
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase 1
[NASA-CR-159453] N80-14182
NBS interagency transducer project 1951 - 1979: An overview
[NBS-TN-1110] N80-14373
TELEVISION EQUIPMENT
Television receiving antenna system component measurements
[PB-298873/1] N80-14329
TELEVISION RECEIVERS
Local oscillator radiation from television receivers
[BBC-RD-1979/21] N80-14287
TELEVISION RECEPTION
Television receiving antenna system component measurements
[PB-298873/1] N80-14329
TELEVISION SYSTEMS
Image transmission via spread spectrum techniques — synthetic aperture radar
[AD-A074606] N80-14308
TEMPERATURE CONTROL
Development and testing of the Solar Control Corporation modular controller and Solarsat subsystem
[NASA-TM-78243] N80-14498
A controlled rate freeze/thaw system for cryopreservation of biological materials
[NASA-CR-162531] N80-14675
TEMPERATURE DEPENDENCE
Ultraviolet spectroscopy of nitrous oxide [N2O]: A temperature-resolved study
[LBL-8739] N80-14225
TEMPERATURE EFFECTS
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop — methodology for structural design criteria for time temperature functions for creep rupture strength
[EPRI-FF-1062-VOL-1] N80-14835
TEMPERATURE MEASUREMENT
Temperature and pressure measurement techniques for an advanced turbine test facility
[NASA-TM-79278] N80-14374
TEMPERATURE MEASURING INSTRUMENTS
Development and testing of the Solar Control Corporation modular controller and Solarsat subsystem
[NASA-TM-78243] N80-14498
TENSILE STRENGTH
Modified Weibull theory for the strength of granular brittle material
[GA-A-15228] N80-14421
TENSOR ANALYSIS
Vacuum polarization in curved spacetime — stress tensor determination
N80-14951
TERNARY ALLOYS
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14242
TERNARY SYSTEMS
Graphitic morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4093] N80-14200
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932
TERRAIN
Ground-wave propagation in a realistic terrain
[BBC-RD-1979/19] N80-14286
TERRESTRIAL PLANETS
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres
[PR-482] N80-15017
TEST CHAMBERS
Investigation of noise hazards in the engine test cell, CFB Baden-Soellingen
[AD-A074391] N80-14147
Reactor for simulation and acceleration of solar ultraviolet damage
[NASA-CR-162533] N80-14405
TEST FACILITIES
Operating manual for the Dynamic Test Set [DTS] for the low voltage power supply part of the AN/ALQ-119 V electronic countermeasures system
[AD-A074894] N80-14345
Temperature and pressure measurement techniques for an advanced turbine test facility
[NASA-TM-79278] N80-14374
TESTS
US Army Test and Evaluation Command test operations procedures: Photographic and video image support aviation materiel
[AD-A074883] N80-14377
TF-41 ENGINE
Application of the multistage axial-flow compressor time-dependent mathematical modeling technique to the TF41-A-1 modified block 76 compressor
[AD-A074478] N80-14134
THEMATIC MAPPING
The mapping of important farmland using remote sensor and socio-economic variables — Ontario County, New York
N80-14424
THEOREM PROVING
Spectral invariance for normal operators under trace class perturbations
N80-14803
THERMAL BATTERIES
Improved thermal battery performance
[AD-A073856] N80-14506

Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
THERMAL BLOOMING
An algebraic model of adaptive optics for continuous-wave thermal blooming
[AD-A074741] N80-14906
THERMAL CONDUCTIVITY
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159164] N80-14197
Anomalous electron thermal conductivity across destroyed magnetic surfaces
[PR-501] N80-14929
THERMAL DEGRADATION
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A074963] N80-14262
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
THERMAL EXPANSION
Thermophysical properties data on graphite/polyimide composite materials
[NASA-CR-159164] N80-14197
THERMAL MAPPING
The application of thermal infrared remote sensing data to soil moisture and evaporation determination
N80-14447
THERMAL PROTECTION
Thermal protection system flight repair kit
[NASA-CR-160417] N80-14176
Shuttle orbiter TPS flight repair kit development
[NASA-CR-160416] N80-14179
Thermal protection system repair kit program
[NASA-CR-160418] N80-14181
Galileo probe thermal protection: Entry heating environments and spallation experiments design
[NASA-CR-152334] N80-14184
THERMAL RESISTANCE
Corrosion resistance of sodium sulfate coated cobalt-chromium-aluminum alloys at 900 C, 1000 C, and 1100 C
[NASA-TM-79311] N80-14234
Surface conforming thermal/pressure seal — for control devices in space vehicles
[NASA-CASE-MSC-18422-1] N80-14400
THERMAL SHOCK
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073654] N80-14342
THERMAL STRESSES
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073654] N80-14342
THERMOCHEMISTRY
Process design and economic analysis of the zinc selenide thermochemical hydrogen cycle
[UCRL-52546] N80-14571
THERMODYNAMIC EFFICIENCY
Results of thermal performance evaluation of the Owens-Illinois sunpack liquid solar collector at indoor conditions
[NASA-CR-161189] N80-14500
THERMODYNAMIC EQUILIBRIUM
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system
[IS-M-212] N80-14953
THERMODYNAMIC PROPERTIES
Basic energy properties of electrolytic solutions database
[LBL-7827] N80-14226
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52648] N80-14253
Thermodynamic properties of nitrogen gas derived from measurements of sound speed — for cryogenic wind tunnels
[NASA-RP-1051] N80-14257
Experiments to show the existence of the liquefaction shock wave in retrograde gases
[MPIS-MITT-67] N80-14367
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector
[NASA-CR-161253] N80-14497
THERMODYNAMICS
Polystyrene in mixed solvents
N80-14345
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4
[CONF-780807-11] N80-14365
An extended soft-cube model for the thermal accommodation of gas atoms on solid surfaces
[NASA-TM-81163] N80-14941
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system
[IS-M-212] N80-14953
THERMOELECTRIC GENERATORS
solar thermal power systems advanced solar thermal technology project, advanced subsystems development
[NASA-CR-162546] N80-14491
THERMOELECTRIC POWER GENERATION
A cesium TELEC experiment at Lewis Research Center
[NASA-CR-159729] N80-14386
THERMOSIPHONS
Development, testing and certification of the sigma research, mast-therm-S-101 thermosyphon heat exchanger
[NASA-TM-78245] N80-14499
THERMOSTATS
Development and testing of the Solar Control Corporation modular controller and Solarstat subsystem
[NASA-TM-78243] N80-14498
THICK FILMS
Thick film fiber optics to integrated optics interface
[EGG-1183-5104] N80-14907
THICKNESS RATIO
Infrared interferometric thickness measurement of polymeric thin films and coatings
[Y-2176] N80-14254
THIN AIRFOILS
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3218] N80-14047
THIN FILMS
Hydraulic jumps in a partially filled rotating cylinder
[K/TS-2936] N80-14362
Heat capacity of amorphous and disordered Nb3Ge thin films
N80-14931
Growth and characterization of epitaxial piezoelectric and semiconductor films
[AD-A073813] N80-14943
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074913] N80-14944
THREE DIMENSIONAL FLOW
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14048
Development of a three-dimensional supersonic inlet flow analysis
[NASA-CR-3218] N80-14356
THRESHOLDS [PERCEPTION]
Derivation of presbycusis and Noise Induced Permanent Threshold Shift [NIPTS] to be used for the basis of a standard on the effects of noise on hearing
[AD-A071310] N80-14690
THRUST CHAMBERS
Performance of a transpiration-regenerative cooled rocket thrust chamber
[NASA-CR-159742] N80-14189
THRUST REVERSAL
Quiet Clean Short-Haul Experimental Engine [QCSEE] acoustic and aerodynamic tests on a scale model over-the-wing thrust reverser and forward thrust nozzle
[NASA-CR-135254] N80-14115
THUNDERSTORMS
Atlanta Air Route Traffic Control Center's involvement in aviation weather
N80-14637
Wind field analyses of severe storms for COMPASS [Cooperative Observational and Modeling Project for the Analysis of Severe Storms]
[PB-300298/7] N80-14662
TIMBER INVENTORY
Forester's guide to aerial photo interpretation — timber inventory
N80-14425
TIME DEPENDENCE
Application of the multistage axial-flow compressor time-dependent mathematical modeling technique to the TF41-A-1 modified block 76 compressor
[AD-A074478] N80-14134
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240
TIME DIVISION MULTIPLE ACCESS
A cost optimal solution for deadlocked processes
[REPT-273] N80-14794
TIME DIVISION MULTIPLEXING
Definition of the hierarchical network for aggressive environments [RHEA] — time division multiplexing and data transmission
N80-14030
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers
[AD-A073356] N80-14306
TIME FUNCTIONS
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop — methodology for structural design criteria for time temperature functions for creep rupture strength
[EPRI-FP-1062-VOL-1] N80-14835
TIME LAG
Adaptive equalization of delay distorted signals
[REPT-13-78] N80-14326
TIME MEASUREMENT
Synchronization of clocks in the 100 ps range
[ESA-TT-578] N80-14381
TIME OF FLIGHT SPECTROMETERS
Photodissociation processes in molecular beams — ozone
[LBL-9219] N80-14886
TIME OPTIMAL CONTROL
Optimal steering of a random motion of a point mass
[CSIR-TWISK-71] N80-14812
TIME SERIES ANALYSIS
Excitation and analysis technique for flight flutter tests
[MBB-UF-1446[O]] N80-14140
TISSUES [BIOLOGY]
Effect of prolonged hypokinesia on tissue blood flow
[NASA-TM-76005] N80-14688
TITANIUM ALLOYS
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14342
TITANIUM CARBIDES
Improved refractory coatings and method of producing the same
[NASA-CASE-LEW-13168-1] N80-14232
TOKAMAK DEVICES
Super-banana limiter as a possible edge cooling scheme
[IPPJ-425] N80-14918
Very small aspect ratio tokamaks
[CONF-780811-32] N80-14924
TOPOGRAPHY
VHF and UHF propagation studies in the Canadian Arctic
[CRC-1327] N80-14288
On the use of digital photogrammetric measurements in the compilation of topographic maps
[SER-1-ORIGINAL-REPT-76] N80-14462
TORNADOES
Severe storms research — congressional reports
[GPO-53-135] N80-14650
TOROIDAL PLASMAS
Super-banana limiter as a possible edge cooling scheme
[IPPJ-425] N80-14918
Non-axial-symmetric Alfven waves in cylindrical, radial inhomogeneous plasmas
[IPF-78-6] N80-14927
TOROIDAL SHELLS
Isometrically deformable synclastic surfaces as flexible waveguides
N80-14335
TORQUE
Torque equilibrium attitude control for Skylab reentry
[NASA-TM-78252] N80-14569
TOXIC DISEASES
Therapy on nerve agent poisoning
N80-14732
TOXIC HAZARDS
Maintenance of air operations while under attack with chemical agents — protective clothing
[AGARD-CP-264-SUPPL] N80-14728
Approaches to CW agent area detection systems for airfields
N80-14733
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
TOXICITY
The effects of acute and chronic low dose exposure to anticholinesterases
N80-14729
TRACKING [POSITION]
World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement
[WMO-528] N80-14659
Process model of how the human operator tracks discontinuous inputs
[AD-A069001] N80-14712
TRACKING NETWORKS
A review of NASA international programs
[NASA-TM-80845] N80-14971
TRACKING RADAR
Digital signal processing techniques in a monopulse tracking radar
N80-14035
TRAILING EDGES
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162530] N80-14052
TRAJECTORY OPTIMIZATION
Research in navigation and optimization for space trajectories
[NASA-CR-160420] N80-14164
TRANSDUCERS
The development of improved normal stress transducers for propellant grains, volume 1
[AD-A073659] N80-14260
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices
[AD-A073660] N80-14261
Design and performance of the drag-disc turbine transducer
[CONF-790655-2] N80-14347
NBS interagency transducer project 1951 - 1979: An overview
[NBS-TN-1110] N80-14373
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[RAE-TR-2021] N80-14376

Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839

TRANSFER FUNCTIONS
The transfer of carbon fibers through a commercial aircraft water separator and air cleaner
[NASA-CR-159183] N80-14359

TRANSFORMATIONS (MATHEMATICS)
A constant percentage bandwidth transform for acoustic signal processing
N80-14380

TRANSIENT RESPONSE
Transient response optimization of piezoelectric disc transducers by time domain techniques
[AD-A073818] N80-14847

TRANSMISSION LINES
Wave propagation in a dc superconducting cable. Part 1: Analysis
[LA-UR-79-226] N80-14346

TRANSONIC COMPRESSORS
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323] N80-14050

TRANSONIC FLOW
An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056
FORTRAN subroutines for out-of-core solutions of large complex linear systems
[NASA-CR-159142] N80-14773

TRANSPONDERS
S + S/X bands coherent transponder specification
[ESA-PSS-40[TTC.C.10-ISSUE-1] N80-14327

TRANSPORT AIRCRAFT
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159180] N80-14054
Accident investigation
N80-14436

TRANSPORT PROPERTIES
Volatile organic compounds in seawater — sources and transport mechanisms
[AD-A074179] N80-14214
Acoustic equations in moving fluids
N80-14860
Quantum field theory methods applied to the physics of condensed matter
[AD-A073509] N80-14940

TRANSPORT THEORY
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385

TRANSPORTATION ENERGY
Electric and hybrid vehicles: Commercialization phase 3 planning
[DOE/ERD-0004] N80-14349

TRAVELING WAVE AMPLIFIERS
Dual beam dual mode TWT
[AD-A074719] N80-14344

TRAVELING WAVE MODULATION
Isometrically deformable synclastic surfaces as flexible waveguides
N80-14335

TRAVELING WAVE TUBES
An examination of ancillary equipment for a proposed 34.3 GHz high power gyrotron TWT amplifier
N80-14156
Dual beam dual mode TWT
[AD-A074719] N80-14344

TREES (PLANTS)
Forester's guide to aerial photo interpretation — timber inventory
N80-14425

TRENDS
Development trends of airport surface traffic control radar
N80-14087

TRIANGLES
Automated numerical integration over a triangle
[CSIR-TWISK-78] N80-14805

TRIANGULATION
Simultaneous multiple camera and multiple focal setting self-calibration in photogrammetry
N80-14372
Calculation of the azimuth of the section between Hohenpeissenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig]
[SER-B-236] N80-14461

TRIAXIAL STRESSES
Triaxial measurement of stress waves in the free-field
[SAND-78-2123C] N80-14420

TRINITROTOLUENE
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211] N80-14367

TRITIUM
Evaluation of fuel resources and requirements for the magnetic fusion energy program
[MLM-2419] N80-14570
Enhancement of D-T reaction rate due to D-T contact
[FPJ-419] N80-14913

TROPOPAUSE
Sulfate and nitrate collected by filter sampling near the tropopause
[NASA-TP-1567] N80-14381

TROPOSPHERE
Ultraviolet spectroscopy of nitrous oxide [N2O]: A temperature-resolved study
[LBL-8739] N80-14225

TUBE HEAT EXCHANGERS
High pressure ceramic heat exchanger. Phase 1: Design and experimental verification
[COO-4236-3] N80-14364
Development, testing and certification of the sigma research, maxi-therm-S-101 thermosyphon heat exchanger
[NASA-TM-78245] N80-14499

TUNGSTEN
Scalable standard optical sources in the VUV: Emission from electron impact on metals — tantalum and tungsten
[NASA-CR-162562] N80-14900

TURBINE BLADES
Digital system for dynamic turbine engine blade displacement measurements
[NASA-TM-81382] N80-14113

TURBINE INSTRUMENTS
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase 1
[NASA-CR-159453] N80-14182

TURBINE PUMPS
Supercharged topping rocket propellant feed system
[NASA-CASE-XLE-02062-1] N80-14188

TURBINES
Lawrence Livermore Laboratory geothermal energy program: A status report on the development of the Total-Flow concept
[UCRL-50046-77] N80-14529
Darrieus wind turbine program at Sandia Laboratories
[SAND-79-0997C] N80-14538

TURBOCOMPRESSORS
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323] N80-14050
Modification of axial compressor streamline program for analysis of engine test data
[NASA-TM-79312] N80-14051
Application of the multistage axial-flow compressor time-dependent mathematical modeling technique to the TF41-A-1 modified block 76 compressor
[AD-A074478] N80-14134

TURBOFAN ENGINES
Quiet Clean Short-Haul Experimental Engine [QCSEE] Over-The-Wing [OTW] propulsion system test report. Volume 2: Aerodynamics and performance — engine performance tests to define propulsion system performance on turbofan engines
[NASA-CR-135324] N80-14120
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556] N80-14121
The CF6 jet engine performance improvement: New front mount
[NASA-CR-159639] N80-14127
Study of turboprop systems reliability and maintenance costs
[NASA-CR-135192] N80-14129
Abradable compressor and turbine seals, volume 1 — for turbofan engines
[NASA-CR-159600] N80-14235

TURBOJET ENGINES
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-valve controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531] N80-14123
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532] N80-14124
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133

TURBOMACHINERY
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase 1
[NASA-CR-159453] N80-14182
Design and performance of the drag-disc turbine transducer
[CONF-790655-2] N80-14347

TURBOPROP ENGINES
Study of turboprop systems reliability and maintenance costs
[NASA-CR-135192] N80-14129

TURBULENCE EFFECTS
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer — in a wind tunnel
[MPIS-MITT-68] N80-14368

TURBULENT BOUNDARY LAYER
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer — in a wind tunnel
[MPIS-MITT-68] N80-14368

TURBULENT FLOW
Separated turbulent flow behind a stalled airfoil
[AAAF-NT-79-12] N80-14059
Investigation of coherent structures in the velocity field of a fully developed turbulent channel flow using flow visualization and anemometry
[MPIS-MITT-66] N80-14366
Aeroacoustic measuring techniques in or outside turbulent flows
N80-14876

TURBULENT HEAT TRANSFER
Ion heating by the current-driven turbulence in an inhomogeneous plasma
[IPPJ-423] N80-14911

TWO DIMENSIONAL JETS
Stability of a flat wall jet
[REPT-79-5] N80-14370

TWO PHASE FLOW
Mass flow rate measurements in two-phase mixtures with stagnation probes
[CONF-790655-1] N80-14363

TYPHOONS
Airborne Expendable Bathythermograph [AXBT] observations immediately before and after passage of typhoon PHYLLIS in August of 1975
[AD-A074809] N80-14666

U

ULTRAHIGH FREQUENCIES
Digital array signal processing techniques applied to guidance and navigation
N80-14032
L-band measurements in the air traffic channel to characterize secondary radar systems
N80-14092

ULTRASONIC DENSIMETERS
Ultrasonic density detector for vessel and reactor core two-phase measurements
[CONF-790646-5] N80-14361

ULTRASONIC FLAW DETECTION
Ultrasonic flaw detection and characterization in structural materials by spectral analysis
[ORNL/TM-6456] N80-14408
Recent improvements to the ASTM-type ultrasonic reference block system — ultrasonic flaw detection used on aluminum blocks
[AD-A074724] N80-14852

ULTRASONIC RADIATION
Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839

ULTRASONICS
Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839
Recent improvements to the ASTM-type ultrasonic reference block system — ultrasonic flaw detection used on aluminum blocks
[AD-A074724] N80-14852

ULTRAVIOLET PHOTOMETRY
Structure of the Mars lower and middle atmosphere based on Mars 5 ultraviolet photometry data
[PR-483] N80-15018

ULTRAVIOLET RADIATION
Reactor for simulation and acceleration of solar ultraviolet damage
[NASA-CR-162533] N80-14405

ULTRAVIOLET SPECTROPHOTOMETERS
Ultraviolet spectroscopic methods for quality control
[MHSMP-79-29] N80-14407

ULTRAVIOLET SPECTROSCOPY
Ultraviolet spectroscopy of nitrous oxide [N2O]: A temperature-resolved study
[LBL-8739] N80-14225
Ultraviolet spectroscopic methods for quality control
[MHSMP-79-29] N80-14407

UNDERGROUND EXPLOSIONS
Seismic discrimination — between earthquakes and underground nuclear explosions
[AD-A073772] N80-14614

UNDERGROUND STORAGE
Compressed air energy storage technology program — concept for supplying electric power to meet peak load demands
[PNL-2935] N80-14534

UNDERGROUND TRANSMISSION LINES
Problems and installation technique of the transmitting media of a circular waveguide link
N80-14298

UNDERWATER ACOUSTICS
A study of the relationship between oceanic chemical mesoscale and sea surface thermal structure as detected by satellite infrared imagery
[AD-A074186] N80-14663

Ultrasonic broad band pulse-echo beam profile analysis in scattering and attenuating media — study of ultrasonic pulsed radiation beams for testing underwater acoustics for transducer receiver network
N80-14839
Underwater sound scattering by marine organisms. A review — sonar interference
[MRL-R-756] N80-14841
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
Acoustic implications of mesoscale oceanographic phenomena — study of effect of ocean currents on acoustic propagation using an ocean model for underwater acoustics
[AD-A074456] N80-14855
Underwater acoustic problems
N80-14872

UNIMOLECULAR STRUCTURES
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880

UNITED STATES OF AMERICA
US energy flow in 1978
N80-14517
United States earthquakes, 1977
[PB-300863/8] N80-14624

UNSATURATION [CHEMISTRY]
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K
[AD-A074264] N80-14215

UNSTEADY FLOW
Unsteady flow and dynamic response analyses for helicopter rotor blades
[NASA-CR-159190] N80-14355

URANIUM
Energy from the West: Energy resource development systems report. Volume 4: Uranium
[PB-299180/0] N80-14466

URANIUM FLUORIDES
High temperature UF6 RF plasma experiments applicable to uranium plasma core reactors
[NASA-CR-159159] N80-14921

URANIUM PLASMAS
High temperature UF6 RF plasma experiments applicable to uranium plasma core reactors
[NASA-CR-159159] N80-14921

URBAN RESEARCH
Barriers to the application of wind energy conversion systems in urban settings
N80-14494
Definition and analysis of the barriers to the implementation of urban energy recovery systems
[ANL/CNSV/TM-2] N80-14525

URBAN TRANSPORTATION
Applications of fuel cells in transportation
[LA-UR-79-628] N80-14526

UREAS
Dialysis system — using ion exchange resin membranes permeable to urea molecules
[NASA-CASE-NPO-14101-1] N80-14687

USER MANUALS [COMPUTER PROGRAMS]
SPAR thermal analysis processors reference manual, system level 16. Volume 1: Program execution
[NASA-CR-159162] N80-14212
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 2: User's guide to computer EMA model
[NASA-CR-160356] N80-14340
GIM code user's manual for the STAR-100 computer — for generating numerical analogs of the conversion laws
[NASA-CR-3157] N80-14354
Baseline software data system. Volume 2: Database reference manual
[AD-A073359] N80-14762
Image processing system software. Volume 1: Users manual
[AD-A073652] N80-14775
Modular programs for the fast solving of linear elliptic equations by reduction methods: TR2D01, TR2D02 to solve the Dirichlet problem for Helmholtz equation; user's manual concerning the club MODULEF
[GMD-MITT-47] N80-14781
US ROLAND 2 Logistics Model [ROLOG]: User's guide
[AD-A074449] N80-14960

USER REQUIREMENTS
User requirements for a patient scheduling system
[NASA-CR-162539] N80-14956

UTILITIES
Electric utility solar energy activities, 1978
[EPRI-ER-966-SR] N80-14560

V

VACUUM TUBE OSCILLATORS
Local oscillator radiation from television receivers
[BBC-RD-1979/21] N80-14287

VACUUM TUBES
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14674-1] N80-14229

VALUE
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702

VANADIUM OXIDES
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system
[IS-M-212] N80-14953

VAPOR PRESSURE
Methods for calculation of engineering parameters for gas separation — vapor pressure and solubility of gases in organic liquids
[NASA-CR-162512] N80-14211

VAPORIZING
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system — for gas turbine engines
[NASA-TP-1582] N80-14125
Potential heat exchange fluids for use in sulfuric acid vaporizers
[NASA-CR-162548] N80-14358
Regolith layering processes based on studies of low-temperature volatile elements in Apollo core samples
[CONF-790381-1] N80-15016

VARIABLE GEOMETRY STRUCTURES
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-598] N80-14790

VARIANCE [STATISTICS]
Comparison of regression, difference and ratio estimates in sample theory
[GMD-MITT-42] N80-14818
An investigation of the power efficiency of the Friedman nonparametric anova test with respect to the one factor repeated measures anova F-test
N80-14825
A general solution to making inferences about the parameters of mixed linear models
N80-14826

VEGETATION GROWTH
Forester's guide to aerial photo interpretation — timber inventory
N80-14425

VELOCITY DISTRIBUTION
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615] N80-14049
Investigation of coherent structures in the velocity field of a fully developed turbulent channel flow using flow visualization and anemometry
[MPIS-MITT-46] N80-14366
The implication of Pn amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14606
Effect of velocity overshoot on the performance of magnetohydrodynamic subsonic diffusers
[NASA-TM-79305] N80-14922

VELOCITY MEASUREMENT
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels — for gas velocity measurement
[AD-A074244] N80-14145
The velocity of clusters of galaxies relative to the microwave background. The possibility of its measurement
[PR-488] N80-15007

VERTICAL DISTRIBUTION
An experimental study of natural convection heat transfer in vertical porous media
N80-14352

VERY LONG BASE INTERFEROMETRY
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603

VERY LOW FREQUENCIES
VLF/LF reflectivity of the polar ionosphere, 3 September - 30 December 1978
[AD-A074475] N80-14317
Ground-based propagation measurements in support of flight evaluation of the E-3A OMEGA navigation system, June - November 1976
[AD-A074474] N80-14321

VIBRATION
Vibration analysis and nondestructive testing using double-exposure holographic techniques
[AD-A073457] N80-14415
Modeling biodynamic effects of vibration, fifth year
[AD-A073819] N80-14719
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880

VIBRATION DAMPING
On the use of vibration self-damping materials in the manufacture of parts for rotating machinery
N80-14135

VIBRATION MEASUREMENT
Digital system for dynamic turbine engine blade displacement measurements
[NASA-TM-81382] N80-14113
Displacement probes with self-contained exciting medium
[NASA-CASE-LAR-11690-1] N80-14371

VIBRATION TESTS
Excitation and analysis technique for flight flutter tests
[MBB-UF-1446[O]] N80-14140
Flight testing of the buffeting behavior of combat aircraft
[ESA-TT-523] N80-14143
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1997] N80-14341

VIBRATIONAL SPECTRA
Vibrational spectra of solid ethane; vibrational spectra of diborane in an argon matrix
N80-14203
Vibration analysis and nondestructive testing using double-exposure holographic techniques
[AD-A073457] N80-14415

VIDEO EQUIPMENT
US Army Test and Evaluation Command test operations procedure: Photographic and video image support aviation material
[AD-A074883] N80-14377

VIEWING
Preliminary investigation of pilot scanning techniques of dial pointing instruments
[NASA-TM-80079] N80-14697

VISCOUS FLOW
Viscous film flows with contact lines: Finite element simulation, a basis for stability assessment and design optimization
N80-14351
Development of a three-dimensional supersonic inlet flow analysis
[NASA-CR-3218] N80-14356

VISION
Visual performance: A method to assess workload in the flight environment
N80-14749

VISUAL AIDS
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/6] N80-14724

VISUAL DISCRIMINATION
A facilitation effect in orientation discrimination
[AD-A072726] N80-14713

VISUAL PERCEPTION
A microprocessor-based random-dot stereogram system — for basic research and clinical testing
N80-14788

VISUAL STIMULI
A facilitation effect in orientation discrimination
[AD-A072726] N80-14713

VOCODERS
Speech enhancement using a soft-decision maximum likelihood noise suppression filter
[AD-A074082] N80-14309
Subband coder study
[AD-A074427] N80-14312
Speech compression and synthesis — vocoders
[AD-A074497] N80-14315

VOICE COMMUNICATION
Vocabulary specification for automatic speech recognition in aircraft cockpits
[AD-A073703] N80-14303
Subband coder study
[AD-A074427] N80-14312

VOLATILITY
Volatile organic compounds in seawater — sources and transport mechanisms
[AD-A074179] N80-14214

VOLTMETERS
Laser power meter intercomparison test evaluated by two variable linear regression analysis
[AD-A074526] N80-14389

VORTICES
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14048
The quasi-vortex-lattice method for wings with edge vortex separation
[NASA-CR-162530] N80-14052
Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14053
On the question of instabilities upstream of cylindrical bodies
[NASA-CR-3231] N80-14357
Wall pressure fluctuations generated by a pair of vortices
[MPIS-6/1979] N80-14369
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations — conducted in the Langley V/STOL tunnel
[NASA-TP-1608] N80-14840

VOYAGER PROJECT
News conference on Voyager-2-Jupiter encounter
[NASA-TM-80854] N80-15008

VOYAGER 1 SPACECRAFT
Voyager mission support
N80-14153
Voyager 1979: Update to the radial and solar cycle variations in the solar wind phase fluctuation spectral index
N80-14160

VOYAGER 2 SPACECRAFT
Voyager mission support
N80-14153

News conference on Voyager-2 Jupiter encounter
[NASA-TM-80854] N80-13018

W

WAFERS
Fracture strength of silicon solar cells
[NASA-CR-162540] N80-14490
WAKES
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14048
WALL FLOW
Hydraulic jumps in a partially filled rotating cylinder
[K/TS-2936] N80-14362
WALL JETS
Stability of a flat wall jet
[REPT-79-5] N80-14370
WALL PRESSURE
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer — in a wind tunnel
[MPSS-MITT-48] N80-14368
Wall pressure fluctuations generated by a pair of vortices
[MPSS-6/1979] N80-14369
WARNING SYSTEMS
Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan
[WMO-524] N80-14658
Approaches to CW agent area detection systems for airfields
N80-14733
WASTE DISPOSAL
Survey of solidification/stabilization technology for hazardous industrial wastes
[PB-299206/3] N80-14278
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles, volume 1
[PB-299105/7] N80-14974
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles. Volume 2: Appendices
[PB-299106/5] N80-14975
WASTE ENERGY UTILIZATION
Definition and analysis of the barriers to the implementation of urban energy recovery systems
[ANL/CNSV/TM-2] N80-14525
WASTE TREATMENT
Development of treatment and control technology for refractory petrochemical wastes
[PB-299291/5] N80-14596
WASTE UTILIZATION
Fast production of methane by anaerobic digestion, volume 1 — solid waste utilization
[COO-2990-17-VOL-1] N80-14368
Pilot plant gasification test on biomass fuels
[PB-299077/5] N80-14372
Commercialization strategy report for energy from urban wastes
[TID-28852-DRAFT] N80-14521
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790373-1] N80-14562
WATER
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074917] N80-14944
WATER COOLED REACTORS
Design and performance of the drag-disc turbine transducer
[CONF-790605-2] N80-14347
Mass flow rate measurements in two-phase mixtures with stagnation probes
[CONF-790655-1] N80-14363
WATER EROSION
Influence of stoichiometry on impingement erosion of lead sulfide and zinc selenide
[AD-A073955] N80-14946
WATER HEATING
Commercialization strategy report for solar water heating
[TID-28856-DRAFT] N80-14545
Commercializing solar heating: A national strategy needed
[PB-297882/3] N80-14575
WATER POLLUTION
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-298473/0] N80-14595
Development of treatment and control technology for refractory petrochemical wastes
[PB-299291/5] N80-14596
WATER QUALITY
Performance evaluation of the Horiba Instruments, Incorporated model U-7 water quality checker
[PB-298815/2] N80-14382
Groundwater resources of the Texas high plains: State-of-the-art and future research needs
[PB-298147/0] N80-14469
Surface water quality parameters for monitoring oil shale development
[PB-297944/7] N80-14470
Interrelationships between man, energy, and water quality: A new methodology for integrative analyses
[BNL-26188] N80-14586
WATER TEMPERATURE
Construction and initial operation of the Miamisburg salt-gradient solar pond
[MLM-2626-OP] N80-14541
WATER TREATMENT
Ozonation of cooling tower waters
[NASA-CASE-NPO-14340-1] N80-14579
WATER WAVES
Wave power systems
[PB-299851/6] N80-14576
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
WATERWAVE ENERGY CONVERSION
Wave power systems
[PB-299851/6] N80-14576
WAVE ATTENUATION
Comparison between the first pluviometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite — to study rain structures affecting radio channels at millimetric wavelengths
N80-14089
WAVE DIFFRACTION
High frequency scattering from a thin lossless dielectric slab
[NASA-CR-162564] N80-14290
Computation of the radiation characteristics of antennas on complicated structures in the high frequency case. Principle of the geometrical theory of diffraction
[ESA-TT-593] N80-14328
Ray tracing and application of the geometrical theory of diffraction for calculating the scattered fields of complicated structures
[ESA-TT-595] N80-14719
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819
Applications of diffraction theory to aeroacoustics — aircraft noise
N80-14870
WAVE DISPERSION
Nondispersive spectroscopy of celestial X-ray sources
N80-14993
WAVE FRONT RECONSTRUCTION
Digital wavefront reconstruction for acoustical applications
[AD-A073775] N80-14845
WAVE FRONTS
Sonic-boom wave-front shapes and curvatures associated with maneuvering flight
[NASA-TP-1611] N80-14045
WAVE FUNCTIONS
Classical theory of radiative transitions
N80-14285
WAVE INTERACTION
Nonlinear interaction of finite-amplitude sound waves
N80-14875
WAVE PROPAGATION
Wave propagation in a dc superconducting cable. Part 1: Analysis
[LA-UR-79-226] N80-14346
Equilibrium and propagation of a rotating relativistic electron beam in the absence of an external guide field
[AD-A074803] N80-14834
Special Course on Acoustic Wave Propagation
[AGARD-R-686] N80-14858
A general survey of studies on acoustic wave propagation
N80-14859
Propagation in ducts
N80-14864
Finite-amplitude wave propagation — acoustic propagation in nonlinear media
N80-14874
WAVE REFLECTION
Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100
Fundamentals of sound reflection and refraction in inhomogeneous media — atmospheric propagation
N80-14861
Experimental determination of the phases of X-ray reflections
N80-14935
WAVE SCATTERING
High frequency scattering from a thin lossless dielectric slab
[NASA-CR-162564] N80-14290
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions
[IPPJ-417] N80-14910
WAVEFORMS
Performance evaluation of a coherent chain in transmission
N80-14083
Robust waveform design
[AD-A074932] N80-14311
WAVEGUIDES
Research on circular waveguide communication systems
[FUB-28] N80-14291
Italian research on millimetric waveguide systems
N80-14292
General considerations about circular waveguide systems
N80-14293
Propagation in circular waveguides
N80-14294
Design of the transmission media of circular waveguides
N80-14295
General criteria for the design of repeating stations of circular waveguide systems
N80-14296
Special passive components for circular waveguides
N80-14297
Problems and installation technique of the transmitting media of a circular waveguide link
N80-14298
Measurement and characterization of manufacturing and installation imperfections of circular waveguides
N80-14299
Measuring methods of the electromagnetic characteristics of circular waveguides
N80-14300
Measuring methods of repeater characteristics for circular waveguide systems
N80-14301
A study on selected wideband guided-wave acousto-optic and electrooptic devices
N80-14899
WEAPONS
Infrared measurements of vehicles and weapons
[AD-A074487] N80-14905
WEAR TESTS
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
WEATHER
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy — solar-terrestrial physics relating to ionospheres. Conference, Germany Jul. 1975
[REPT-55/1977] N80-14609
Sun-weather relationships: A branch of solar-terrestrial physics
N80-14613
Needed weather information where it belongs; in the cockpit
N80-14635
Accident investigation
N80-14636
Effect of weather conditions on airport operations
N80-14638
WEATHER FORECASTING
National report: Meteorology for 1975-1979 — Czechoslovakian activities
N80-14649
Severe storms research — congressional reports
[GPO-52-135] N80-14650
Current research on aviation weather [bibliography]. 1979
[NASA-CR-3214] N80-14651
Methods and programs to utilize satellite indirect soundings in environmental analysis and prediction
[AD-A074772] N80-14654
Report of the Second Session of the WAMEX Scientific and Management Regional Committee
[GARP-SPEC-REPT-33] N80-14657
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan
[WMO-524] N80-14658
World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement
[WMO-528] N80-14659
WEATHER RECONNAISSANCE AIRCRAFT
The T-28 thunder/hailstorm penetration aircraft
N80-14640
WEATHER STATIONS
Assessment of the applicability of the national fire weather data library to wind energy analyses
[PNL-2538] N80-14655
WEIBULL DENSITY FUNCTIONS
Modified Weibull theory for the strength of granular brittle material
[GA-A-15228] N80-14421
A computer program for estimation of parameters of the Weibull intensity function and for the Cramer-Von Mises goodness of fit test
[AD-A074764] N80-14777
WEIGHT MEASUREMENT
Liquid weighing by buoyancy technique
[GEFR-SP-158] N80-14836
WEIGHTING FUNCTIONS
Validation and error in multiplicative utility functions
[AD-A073362] N80-14698
A criterion validation of multiattribute utility analysis and of a group communication strategy
[AD-A073364] N80-14699

Importance weight assessment for additive, ridden preference functions: A review
[AD-A073365] N80-14700
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702

WEIGHTLESSNESS
Recent advances in Aeronautical and Space Medicine
[AGARD-CP-265] N80-14678
Physiological factors in space operations. Emphasis on space shuttle
N80-14682

WELDED STRUCTURES
Ultrasonic flaw detection and characterization in structural materials by spectral analysis
[ORNL/TM-6456] N80-14408

WHEAT
Biological conversion of biomass to methane
[COO-2917-12] N80-14270

WIND [METEOROLOGY]
Meteor wind over Atlanta, 34 deg north, 84 deg west
N80-14628
A statistical analysis of extreme chinooks in Montana as they relate to large scale circulation changes
N80-14630

WIND PROFILES
Meteor wind over Atlanta, 34 deg north, 84 deg west
N80-14628

WIND TUNNEL APPARATUS
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188] N80-14046

WIND TUNNEL MODELS
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159180] N80-14054

WIND TUNNEL TESTS
Two dimensional aerodynamic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels — computational fluid dynamics
[NASA-CR-3210] N80-14047
Study of the formation of laminar flow separation induced by the deflection of a control surface — during hypersonic wind tunnel tests
[REPT-79-2] N80-14060
Wind-tunnel investigation of the flow corrections for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg — Langley 12-foot low speed wind tunnel test
[NASA-TM-80189] N80-14110
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet — Lewis 10- by 10-ft. supersonic wind tunnel test
[NASA-TP-1532] N80-14124
Wind tunnel test of a full-scale heliostat
[SAND-79-8034] N80-14556

WIND TUNNEL WALLS
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer — in a wind tunnel
[MPIS-MITT-68] N80-14368

WIND TUNNELS
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels — for gas velocity measurement
[AD-A074244] N80-14145
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects — development of arc heated wind tunnel for atmospheric entry simulation to measure stagnation point
[AD-A074635] N80-14146

WIND VELOCITY
Wind field analyses of severe storms for COMPASS [Cooperative Observational and Modeling Project for the Analysis of Severe Storms]
[PB-300298/7] N80-14661

WINDPOWER UTILIZATION
A probabilistic study of wind-electric conversion systems from the point of view of reliability and capacity credit
N80-14475
Analysis and simulation of wind energy systems
[NASA-CR-162538] N80-14487
Barriers to the application of wind energy conversion systems in urban settings
N80-14494
Analysis of remote site energy storage and generation systems — systems analysis of solar energy conversion and windpower utilization energy storage systems
[AD-A074869] N80-14504
Darrieus wind turbine program at Sandia Laboratories
[SAND-79-0997C] N80-14538
Commercialization strategy report for small wind systems
[TID-28844-DRAFT] N80-14543
Commercialization strategy report for large wind systems
[TID-28843-DRAFT] N80-14544
Assessment of the applicability of the national fire weather data library to wind energy analyses
[PNL-2538] N80-14655

WINDPOWERED GENERATORS
Analysis and simulation of wind energy systems
[NASA-CR-162538] N80-14487
Commercialization strategy report for large wind systems
[TID-28843-DRAFT] N80-14544

WING NACELLE CONFIGURATIONS
Quiet Clean Short-Haul Experimental Engine [QCSEE]. Under-the-wing [UTW] engine buildplate Nacelle test report. Volume 2: Aerodynamics and performance
[NASA-CR-135250] N80-14116

WING OSCILLATIONS
An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056

WING PROFILES
Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14053

WINGLETS
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159180] N80-14054

WINGS
Optimized aerodynamic design process for subsonic transport wing fitted with winglets — wind tunnel model
[NASA-CR-159180] N80-14054

WIRE
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819

WORK
Work performance as a function of the interaction of ability, work values, and the perceived work environment
[AD-A068893] N80-14707
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress
N80-14740

WORK CAPACITY
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress
N80-14740

WORKLOADS [PSYCHOPHYSIOLOGY]
Survey of methods to assess workload
[AGARD-AG-246] N80-14739
Concepts of workload — study of work capacity and pilot performance in terms of physiological and psychological stress
N80-14740
Some considerations concerning methods to evaluate and assess workload in aircraft pilots
N80-14743
Physiologic aspects of workload/fatigue/stress
N80-14744
Aircrew workload assessment techniques — human factors engineering study of performance of flight crews workloads
N80-14746
Workload assessment methodology development
N80-14747

WORLD METEOROLOGICAL ORGANIZATION
World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan
[WMO-524] N80-14658
World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement
[WMO-528] N80-14659

X

X RAY ASTRONOMY
HEAO Science Symposium
[NASA-CP-2113] N80-14977
A high energy astronomy overview
N80-14992

X RAY DIFFRACTION
An X-ray study of the region around static and fatigue cracks
N80-14411
Experimental determination of the phases of X-ray reflections
N80-14935
X-ray diffraction studies of shocked lunar analogs
[NASA-CR-162555] N80-15011

X RAY IMAGERY
Soft X-ray measurements for investigating plasma focus dynamics
[IPF-78-1] N80-14925

X RAY SOURCES
X-ray variability observed with HEAO A-1
N80-14978
Progress of the HEAO A-1 catalog — all sky map of X-ray sources
N80-14979
The scientific results of the low energy portion of A-2
N80-14980
HEAO A-2 extragalactic results
N80-14981
A-3 scientific results
N80-14982
A-3 scientific results - extragalactic
N80-14983
High energy X-ray results from HEAO-1: X-ray pulsars, and the all sky survey
N80-14984
A-4 scientific results
N80-14985
X-ray emission from the region of gamma 195+5
N80-14986
Diffuse X-ray emission from Abell clusters
N80-14987
Correlated ground based observations in support of the HEAO-1 X-ray observatory
N80-14988
The HEAO-1 neutron star timing experiment
N80-14989
X-ray iron-line emission from the SN 185 remnant
N80-14990
Optical identification and spectroscopy of X-ray sources precisely positioned with A-3
N80-14991
Nondispersive spectroscopy of celestial X-ray sources
N80-14993
Einstein observations of extended galactic X-ray sources
N80-14996
Einstein observations of active galaxies and quasars
N80-14997
The structure and evolution of X-ray clusters of galaxies
N80-14998
Columbia/Einstein observations of galactic X-ray sources
[CONTRIB-179] N80-14999
Columbia/Einstein observations of extragalactic X-ray sources
[CONTRIB-180] N80-15000
Hard X-ray observation of Cygnus-3
[MPI-PAE/EXTRATERREST-135] N80-15002

X RAY SPECTROSCOPY
High resolution X-ray spectroscopy on the Einstein Observatory
N80-14994

XENON LAMPS
Multiple anode arc lamp system
[NASA-CASE-NPO-10857-1] N80-14330

Z

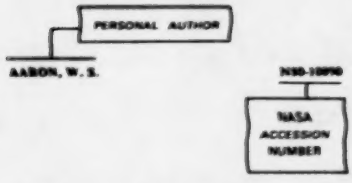
ZINC SELENIDES
Process design and economic analysis of the zinc selenide thermochemical hydrogen cycle
[UCRL-52546] N80-14571
Influence of stoichiometry on impingement erosion of lead sulfide and zinc selenide
[AD-A073955] N80-14946

ZIRCONIUM ALLOYS
Iodine stress-corrosion cracking in irradiated Zircaloy cladding
[CONF-790441-7] N80-14237

ZIRCONIUM TITANATES
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14242

PERSONAL AUTHOR INDEX

Typical Personal Author
Index Listing



Listings in this Index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABBOTT, I. F. N80-14950
ABILOCK, H. N80-14514
ABRAHAM, B. M. N80-14265
ACASHO, U. A. N80-14552
ADALL, S. N80-14401
ADLER, A. N80-14182
ADLER, I. N80-14408
AEBY, I. N80-14907
AHMAD, S. H. N80-14277
AHMED, A. H. N80-14822
AJELLO, J. M. N80-14877
ALBANESE, R. A. N80-14748
ALBEE, A. L. N80-15014
N80-15015
ALEONARD, C. N80-14021
ALEXANDER, J. G. N80-14199
ALEXANDER, M. N80-14692
ALLEN, D. N80-14106
ALLEN, G. P. N80-14403
ALT, R. E. N80-14194
AMBROSIONI, F. N80-14035
AMINABHAVI, T. M. N80-14245
ANDERSON, J. O. N80-14664
ANDERSON, L. A. N80-14504
ANDERSON, S. H. N80-14242
ANDERSON, T. D. N80-14509
ANDERSON, W. P. N80-14112
ANSELMO, V. J. N80-14675
ANTONIO, C. N80-14201
ANTONOPOULOS, A. A. N80-14277
AONO, O. N80-14913
APOLLONI, G. N80-14080
APPELMAN, E. H. N80-14265
ARANOVICH, J. N80-14564
ARAVE, A. E. N80-14361
ARCHBOLD, P. N80-14563
ARMSTRONG, G. E. N80-14957
N80-14958
N80-14959
ARMSTRONG, R. W. N80-14334
ARVEDSON, M. A. M. N80-14207
ASHWORTH, J. N80-14520
ASTLE, L. N80-14689
AUH, P. C. N80-14552
AUSTIN, A. L. N80-14529
AUVERMANN, H. J. N80-14653
AVERILL, R. H. N80-14347
AVERY, T. E. N80-14425

B

BAEHR, E. F. N80-14684
BAER, M. N80-14655
BAIER, W. N80-14450
BAILEY, M. C. N80-14289
BAKER, B. D. N80-14171
BAKER, D. N. N80-14173
BAKER, N. R. N80-14263
BALAKRISHNAN, A. N80-14184
BALDRIDGE, W. S.
BALLARD, J. D.
BALLARD, S. C.
BALLUFFI, R. W.
BANERJEE, M. K.
BANJAVIC, R. A.
BARALE, G.
BARBER, B.
BARGER, R. L.
BARRANGER, J. P.
BARRETT, E. C.
BARRON, F. H.
BARRON, O. L.
BARRON, W.
BARTERA, R. E.
BARTLETT, C. J.
BARTLETT, E. S.
BARTLIT, J. R.
BARWICK, J. T. F.
BASTIANINI, G.
BATES, J. O.
BATTEN, J. J.
BAUER, S. J.
BAUM, R.
BAUM, R. A.
BAYLISS, A.
BAZELAIRE, E.
BEARD, J. L.
BEARDEN, T. E.
BEATTY, J.
BEATY, D. W.
BECKER, J. M.
BEEBE, Y.
BEH, H.
BELBOT, E. F.
BELL, T. E.
BELLO, R. C.
BENELLI, G.
BENI, P.
BENNETT, R. O.
BERENY, J. A.
BERMAN, A. L.
BERMAN, A. S.
BERMAN, P. R.
BERMUDEZ, J. M.
BERNARDI, P.
BERNSTEIN, E. M.
BEROUTI, M.
BERTINI, F.
BERTOLANI, F.
BERTOLAZZI, P.
BETINI, S.
BEY, P.
BIANCO, L.
BIER, M.
BIGGS, F.
BISHOP, K.
BISHOP, W. S.
BJORNO, L.
BJURSTEDT, H.
BLACK, G.
BLACK, R. A.
BLACKMON, W.
N80-15014 BLANCHARD, M. B. N80-15012
N80-15015 BLANCHET, M. N80-14908
N80-14049 BLAUNSTEIN, R. N80-14543
N80-14463 N80-14544
N80-14464 BLAZEK, C. F. N80-14263
N80-14465 BLOCH, S. N80-14032
N80-14466 BLODGETT, M. L. N80-14644
N80-14467 BLUMEN, L. S. N80-14055
N80-14468 BLURTON, K. F. N80-14523
N80-14947 BOBBETT, R. N80-14526
N80-14948 BOIARSKI, A. A. N80-14146
N80-14949 BOISSEAU, J. P. N80-14708
N80-14895 BOLDT, E. N80-14981
N80-14839 BOLLMANN, J. N80-14628
N80-14075 BOLOGNIN, A. N80-14078
N80-14162 N80-14079
N80-14043 BOOKER, M. E. N80-14835
N80-14128 BOUX, J. A. N80-14944
N80-14440 BOWLES, K. J. N80-14196
N80-14452 BOWMAN, B. F. N80-14800
N80-14453 BOWMAN, B. M. N80-14723
N80-14454 N80-14724
N80-14455 N80-14725
N80-14456 N80-14726
N80-14457 N80-14727
N80-14698 BOWMAN, M. K. N80-14228
N80-14333 BOWMAN, R. G. N80-14208
N80-14578 BOWSER, R. P. N80-14541
N80-14330 BOX, G. P. N80-14815
N80-14710 BOXWELL, D. A. N80-14107
N80-14967 BRADY, J. V. N80-14705
N80-14584 BRAINARD, W. A. N80-14232
N80-14285 BRANDIS, H. P., III N80-14801
N80-14073 *BRANDO, T.* N80-14890
N80-14563 BRANNIGAN, V. N80-14275
N80-14233 BRATANOW, T. N80-14355
N80-14612 BRAZIER, S. G. N80-14782
N80-14486 N80-14783
N80-14029 N80-14784
N80-14873 N80-14785
N80-14908 BRECHEISEN, A. N. N80-14470
N80-14458 BRENT, R. P. N80-14764
N80-14711 BRETHERTON, F. P. N80-14831
N80-14752 BRICTSON, C. A. N80-14753
N80-15016 BRIER, S. S. N80-14827
N80-15015 BRIGGS, W. E. N80-14260
N80-14727 N80-14261
N80-14756 BRISCOE, H. M. N80-14404
N80-14141 *BRITT, E. J.* N80-14386
N80-14777 BRODRICK, J. R. N80-14524
N80-14715 BROLLEY, J. E. N80-14620
N80-14378 BRONSON, J. C. N80-14856
N80-14099 BROWAEYS, F. N80-14041
N80-14088 BROWN, C. N80-14220
N80-14723 BROWN, D. W. N80-14155
N80-14724 BROWN, J. L. N80-14713
N80-14725 BROWN, P. N80-14972
N80-14726 BROWN, P. W. N80-14136
N80-14727 BROWN, S. D. N80-14216
N80-14574 BRUCKNER, R. E. N80-14178
N80-14152 BRUEGGEMANN, H. N80-14629
N80-14160 BRUMBERG, V. A. N80-14672
N80-14362 BRUNSTEIN, A. I. N80-14636
N80-14881 BRYAN, J. L. N80-14275
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N80-14070 BUIAI N80-14255
N80-14071 BUIS, M. N80-14030
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N80-14677 BURNEY, S. M., JR. N80-14957
N80-14213 N80-14958
N80-14508 N80-14959
N80-14389 BUSH, D. M. N80-14513

BUTI, L. NRI-14301
BUXBAUM, O. NRI-14422
BYRNES, H. J. NRI-14590

C

CACOPARDI, S. NRI-14093
CADIGAN, F. C. NRI-14729
CAFLISCH, G. B. NRI-14209
CAHN, J. W. NRI-14948
NRI-14949
CALANDRA, E. NRI-14085
CALDWELL, R. L. NRI-14962
CALLAWAY, A. A. NRI-14020
CALVERT, S. NRI-14590
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CAMP, D. W. NRI-14197
CAMPBELL, M. D. NRI-14623
CAMPBELL, R. A. NRI-14791
CAMPBELL, R. H. NRI-14754
CANNINGS, R. NRI-14116
CANNON, D. G. NRI-14310
CAPETANAKIS, J. I. NRI-14092
CAPPADONA, B. NRI-14084
CAPPONI, G. NRI-14089
CAPSONI, C. NRI-14106
CARLI, E. NRI-14296
CARLING, R. NRI-14964
CARLING, R. W. NRI-14532
CARLOCK, B. G. NRI-14763
CARLSON, L. R. NRI-14886
CARMICHAEL, B. C. NRI-14483
CARNOW, B. NRI-14696
CARPENTER, B. G. NRI-14693
CASSARA, F. A. NRI-14324
CASTELLANI, V. NRI-14205
CATHEY, F. W. NRI-14802
CAUSEBROOK, J. H. NRI-14286
CHAMBARET, J. P. NRI-14908
CHAMBERLIN, C. E. NRI-14134
CHAN, J. NRI-14379
CHANEY, R. E. NRI-14229
CHAO, C. M. NRI-14383
CHAPMAN, C. R. NRI-15003
CHARTOCK, M. A. NRI-14463
NRI-14864
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CHEN, C. P. NRI-14690
CHEN, D. T. NRI-14665
CHENG, C. H. NRI-14246
CHERNIAVSKY, E. A. NRI-14514
CHEUNG, R. S. NRI-14312
CHIANG, S. H. NRI-14502
CHILDS, J. NRI-14655
CHINNERY, M. A. NRI-14614
CHIPMAN, M. NRI-14729
CHIRICI, R. NRI-14103
CHOWDHURI, P. NRI-14346
CHRISTENSEN, A. H. J. NRI-14426
CHRISTY, W. NRI-14218
CHUNG, S. NRI-14482
CHURCH, R. L. NRI-14511
CHURCHILL, T. NRI-14721
CHUTJIAN, A. NRI-14877
CIOWDHURI, D. J. NRI-14852
CIVELEK, P. NRI-14653
CHYNOWETH, T. NRI-14564
CIAVARELLI, A. P. NRI-14753
CINI, M. NRI-14070
CLANTON, U. NRI-15012
CLARK, G. W. NRI-14994
CLARK, J. S. NRI-14693
CLAYTON, F. W. NRI-14616
CLINE, V. A. NRI-14145
CLUSEN, R. C. NRI-14349
COCHRAN, R. P. NRI-14374
COCO, J. H. NRI-14596
COFFEY, H. E. NRI-15019
NRI-15020
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COFFMAN, J. L. NRI-14624
COHEN, A. S. NRI-14562
COHEN, R. L. NRI-14845
COLLINSON, R. P. G. NRI-14025
COLOMY, J. R. NRI-14634
COMPTON, R. T., JR. NRI-14307
CONTEAS, A. D. NRI-14160
CONWAY, J. B. NRI-14835
CONWAY, T. M. NRI-14568
COOK, E. V. NRI-14408
COOLEY, R. L. NRI-14317
COOPER, I. P. NRI-14125
COPELAND, R. J. NRI-14269
CORAZZA, G. C. NRI-14294
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CORZANI, T. NRI-14104
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COSELL, L. NRI-14315
COSTOGUE, E. NRI-14492
COURREGES, F. NRI-14564
COWARD, W. E. NRI-14117
NRI-14118
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CRAMPTON, S. B.
CRAWFORD, B. M.
CRELLIN, E. B.
CRIMMINS, F. T.
CRISP, J. N.
CRUZ, J. B., JR.
CURTIS, C.

D

DAHL, H.
DAHLEN, T.
DAILEY, C.
DALBEY, M.
DALLEMESE, E.
DANILOV, I. V.
DANJO, A.
DARDIS, R.
DARIOLIA, R.
DAVIS, G. B.
DAVIS, J. M.
DAVIS, P.
DAVIS, R. C.
DEAL, P. L.
DEASON, V. A.
DEBONIS, C.
DEEPACK, A.
DEFFENBAUGH, F. D.
DEFINA, G.
DEGRUSON, J. A.
DEITZ, P. H.
DEJONGHE, L. C.
DEL, N.
DEMAS, J. N.
DEMERDASH, N. A. O.
DEMOMENT, A.
DENNIS, R. E.
DERHAGOPIAN, J.
DESMUKHI, R. G.
DETHOMAS, A. P.
DETTLEFF, G.
DEVORE, R. V.
DEYDIMOV, I.
DHINDAW, B.
DIBLASIO, G.
DIERCKS, D. R.
DIFAUSTO, M.
DIMARO, R.
DIONNE, J. V.
DISTASIO, F. A., JR.
DIVAKARUNI, S. M.
DIVONE, L. V.
DOAK, P. E.
DODSON, D.
DODSON, J.
DOELLING, N.
DOLAS, P. M.
DOMMERMUTH, F.
DONIACH, S.
DONNELLY, H.
DORY, R. A.
DOWNS, G. F.
DOYSEY, R.
DRAGO, R. S.
DRAKE, E. F.
DREYFUS, M. G.
DRYER, F. L.
DUBL, A.
DUFF, W. S.
DUFFY, R. E.
DUNKIN, S.
DUNN, B. B.
DUNSTAN, I. C.
DUPONT, J. C.
DURFEE, G. L.
DUROX, D.
DUVALL, L. M.

E

EASTERLY, J. L.
EBERL, E. G.
ECCLESTON, B. H.
EDLER, H. G.
EDWARDS, B.
EDWARDS, W.
EHDE, C. L.
EHLERS, F. E.
EHLS, L. C., III NRI-14659
EL-SAWY, A. R. H. NRI-14311
ELWELL, D. NRI-14942
EMURIAN, H. H. NRI-14705
ENABNIT, D. B. NRI-14668
ENGIN, A. E. NRI-14695
ENSIGN, C. R. NRI-14835
ERICKSON, L. NRI-14379
ERMAK, D. L. NRI-14585
ERNST, D. M. NRI-14185
ERNSTING, J. NRI-14660
NRI-14728
ETTER, D. E. NRI-14540
EVANS, R. S., II NRI-14268
EVERY, M. G. NRI-14062
EVRARD, E. NRI-14679
EWALT, D. NRI-14760

F

FAHEY, J. M. NRI-14415
FALCIASECCA, G. NRI-14104
NRI-14294
NRI-14295
NRI-14299
NRI-14508
FALICK, L. NRI-14716
FALLON, P. F. NRI-14153
FANELLI, N. NRI-14078
FANTACCI, F. NRI-15004
FANTE, R. L. NRI-14262
FARBER, M. NRI-14964
FARRELL, J. NRI-14127
FASCHING, W. A. NRI-14035
FAZIO, U. NRI-14126
FEAR, J. S. NRI-14688
FEDOTOVA, V. F. NRI-14564
FEHRENBRUCH, A. L. NRI-14942
FEIGELSON, R. S. NRI-14492
FERBER, R. NRI-14104
FERDANI, F. NRI-14073
FERRI, U. NRI-14244
FICKETT, F. R. NRI-14363
FINCKE, J. R. NRI-14417
FINGER, D. G. NRI-14268
FINNEY, C. D. NRI-14268
FINNEY, E. A. NRI-14408
FITTING, D. W. NRI-14329
FITZGERREL, R. G. NRI-14811
FLACHS, J. NRI-14371
FLAGGE, B. NRI-14720
FLEISHMAN, E. A. NRI-14031
FLETCHER, B. G. NRI-14781
FOERSTER, H. NRI-14884
FOLEY, H. M. NRI-14731
FONNUM, F. NRI-14128
FORD, M. J. NRI-14347
FORD, R. E. NRI-14501
FORNEY, J. A. NRI-14147
FORSHAW, S. E. NRI-14099
FOSSI, M. NRI-14608
FOSTER, G. M. NRI-14962
FOSTER, K. F. NRI-14660
FOTHERINGHAM, R. NRI-14260
FRANCIS, E. C. NRI-14261
FRANCO, M. NRI-14908
FRANTA, G. NRI-14548
FRASCHETTI, G. NRI-14068
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FRASER, C. S. NRI-14372
FRAYSSE, G. NRI-14451
FRAZINE, D. F. NRI-14194
FREDERICKSON, A. R. NRI-14891
FREED, R. K. NRI-14463
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FRENCH, K. R. NRI-14579
FRERE, M. NRI-14441
FRIED, D. L. NRI-14901
FRIEDELL, M. NRI-14964
FRIEDMAN, N. NRI-14978
FROMME, J. NRI-14047
FROSCH, R. A. NRI-15010
FROST, W. NRI-14633
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FUCHS, H. V. NRI-14876

G

GABRIELLI, W. F., JR. NRI-14701
GAINES, G. B. NRI-14483
GALEEV, A. A. NRI-14929
GALPIN, J. S. NRI-14806
GARDNER, A. NRI-14797
GARDNER, R. J. NRI-14810
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GARMIRE, G. NRI-14980
GARRETT, H. B. NRI-14170
NRI-14186

GARTNER, W. B. N80-14740
N80-14741
GASPA, P. H. V. N80-14735
GATHERS, G. R. N80-14857
GATLIN, H. G. N80-14635
GAUL, J. N80-14250
GAUTHIER, M. R. N80-14332
GAY, R. C. N80-14573
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GEBHARDT, D. L. N80-14720
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GERLACH, V. S. N80-14709
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GETSON, P. R. N80-14825
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GIACCARI, E. N80-14079
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GIULI, D. N80-14079
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GLASSMAN, I. N80-14587
GLINSKI, P. T. N80-14775
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GOEBEL, F. N80-14505
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GOODRICH, L. D. N80-14347
GORAK, R. J. N80-14406
GORDON, R. I. N80-14227
GOSS, J. R. N80-14272
GOULDING, F. S. N80-14348
GRADY, P. J. N80-14199
GRANA, D. C. N80-14676
GRANT, R. L. N80-14630
GRAVES, T. S. N80-14824
GRAZI, R. N80-14069
GREEN, B. N80-14520
GREEN, P. E., JR. N80-14854
GREENHALGH, S. A. N80-14604
GREYWALL, M. S. N80-14922
GRIFFIN, C. R. N80-14183
GRIFFITH, J. S. N80-14489
GRIFFITHS, L. J. N80-14319
GRIFFITHS, R. N80-14991
GRIPPO, L. N80-14070
GROS, J. N80-14543
N80-14544
GROTRIAN-STEINWEG, I. N80-14799
GRUBER, R. P. N80-14472
GSCHWEND, P. M. N80-14214
GUDIKEN, P. H. N80-14585
GUERNIGOU, J. N80-14195
GUISE, D. F. N80-14331
GUPTA, A. N80-14405
GUY, R. W. N80-14951

H

HAAK, N. N80-14792
HAERENDEL, G. N80-14621
HAFER, D. E. N80-14836
HAGEY, G. N80-14972
HAGIE, L. T. N80-14836
HAHN, S. F. N80-14909
HAIDL, G. N80-14140
HAILER, H. N80-14926
HALL, J. R., JR. N80-14276
HALL, T. A. N80-14463
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HALVERSON, D. R. N80-14283
HAM, V. N80-14241
HAMMOND, D. L. N80-14665
HANASHIRO, H. N80-14912
HANKINS, J. D. N80-14495
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HANNA, J. S. N80-14855
HANNON, R. L. N80-14707
HANSE, R. E. N80-15011
HARMAN, W. H. N80-14064
HARRIS, J. C. N80-14583
HARRIS, R. L., SR. N80-14697
HARRISON, R. G. N80-14675
HARTMAN, B. O. N80-14739
N80-14745
HARTMANN, M. J. N80-14588
HARTZELL, E. J. N80-14712
HARVEY, D. W. N80-14192
HARVEY, E. B. N80-14508
HARVEY, G. L. N80-14902
HARVEY, S. N80-14689
HASBACH, W. N80-14692
HASHIN, Z. N80-14418
HATAKEYAMA, R. N80-14914
HATLEY, V. W. N80-14704
HATZE, H. N80-14807
HAWKINS, D. M. N80-14806
N80-14808
HAWKINS, F. H. N80-14734
HEIDERGOTT, K. W. N80-14137
HEIDERSBACH, R. N80-14220
HEISLER, S. I. N80-14601
HENDRIX, R. A. N80-14019
HENSCHEL, D. B. N80-14595
HEPPNER, D. B. N80-14718
HERENDEEN, R. A. N80-14516
HEROT, C. F. N80-14964
HILL, S. M. R. N80-15014
N80-15015
HILLIMAN, E. L. N80-14511
HINO, T. N80-14912
HISKES, J. R. N80-14887
HITOKI, S. N80-14913
HIVERT, A. N80-14243
HO, F. N80-14421
HOAD, D. R. N80-14840
HOAGLAND, R. G. N80-14906
HOEKS, R. N80-14182
HOENING, S. A. N80-14593
HOFBAUER, M. N80-14366
HOFFMAN, D. M. N80-14253
HOFFMAN, R. G. N80-14706
HOFFMEISTER, E. D. N80-14430
HOGAN, J. C. N80-14720
HOLDEN, J. N80-14696
HOLL, M. M. N80-14654
HOLLAND, J. C. N80-14205
HOLLENBACH, D. J. N80-14941
HOLMES-SIEDLE, A. N80-14380
HOLT, S. N80-14993
HOMICK, J. L. N80-14682
HOMMEIDA, A. N80-14135
HOMYAK, L. N80-14121
HOOKWAY, R. O. N80-14132
HORDINSKY, J. R. N80-14681
HORTON, K. N80-14791
HOSCHKA, P. N80-14818
HOUBOLT, J. C. N80-14639
HOWARD, J. A. N80-14442
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HOWE, R. D. N80-14579
HOWELL, Y. N80-14574
HOWLAND, D. N80-14596
HUBER, R. K. N80-14043
HUDGINS, J. L. N80-14423
HUDSON, R. D. N80-14641
HUERRE, P. N80-14842
HUFF, S. L. N80-14778
HUGHES, R. N80-14900
HUISMAN, W. C. N80-14813
HULSTROM, R. L. N80-14617
HUMENIK, F. M. N80-14581
HUMPHREY, M. F. N80-14579
HUNDEMANN, A. S. N80-14626
HUNTER, W. F. N80-14055
HURAX N80-14255
HURST, L. G. N80-14235

I

IAFOLLA, N. N80-14076
IDO, K. N80-14916
IGOE, W. B. N80-14046
IKUTA, K. N80-14918
INGBERMAN, A. K. N80-14543
N80-14544
INGLE, W. M. N80-14229
INOUYE, H. N80-14242
INUTAKE, M. N80-14914
IOUP, J. N80-14879
ISAACS, H. S. N80-14522
ISHII, K. N80-14917
IWASAKI, R. S. N80-14281
IZAKOV, M. N. N80-15017

J

JACOBS, F. A. N80-14413
JACOBSON, T. P. N80-14249
JACOVITTI, G. N80-14093
JAGACINSKI, R. J. N80-14712
JANZEN, J. N80-14379
JENNINGS, R. D. N80-14329
JENNINGS, S. G. N80-14653
JESSEL, A. J. N80-14399
JESSER, W. A. N80-14198
JETER, D. W. N80-14836
JEX, H. R. N80-14719
JIM, C. W. N80-14319
JOHN, H. N80-14058
JOHN, R. S. N80-14699
N80-14700
N80-14702
JOHNSON, D. L. N80-14690
JOHNSON, J. R. N80-14772
JOHNSON, K. W. N80-14629
JOHNSON, R. H. N80-14031
JOHNSON, W. N80-14977
JOHNSON, W. G., JR. N80-14046
JOHNSON, W. W. N80-14712
JONES, C. N80-14998
JONES, D. N80-14135
JONES, G., II N80-14502
N80-14503
JORDAN, A. N80-14812
JORDAN, A. M. N80-14828
JOSHI, D. S. N80-14044
JOVANOVIC, S. N80-15016
JUANG, L. L. N80-14514
JUROSHEK, J. R. N80-14329

K

KAAFILBLF, D. H. N80-14489
KALABOWSKY, C. R. N80-14321
KALOGEROPOULOS, T. E. N80-14990
KANIUTH, K. N80-14461
KAPLAN, P. N80-14586
KARAMCHETI, K. N80-14842
KARTER, M. J., JR. N80-14276
KASSAM, A. H. N80-14445
KATCHER, B. L. N80-14710
KATZ, M. N80-14972
KAUFMAN, H. R. N80-14923
KAWATA, T. N80-14910
KECKLER, C. R. N80-14163
KELLEY, D. F. N80-14080
KELLEY, H. J. N80-14164
KENDALL, W. B. N80-14171
KENDZIORRA, E. N80-15002
KENNEL, H. F. N80-14169
KENT, J. S. N80-14063
KIBLER, K. S. N80-14136
N80-14163
KIM, B. N80-14899
KIM, W. C. N80-14823
KIM, Y. N. N80-14838
KIMBALL, K. N80-14749
KING, J. W. N80-14613
KING, W. B. N80-14304
KINNEY, W. L. N80-14470
KINSLOW, M. N80-14193
KIRALY, L. J. N80-14113
KITTINGER, D. C. N80-14061
KLEIN, E. N80-14596
KLEIN, K. E. N80-14681
KLEINOEDER, W. N80-14431
KLEMETTI, W. N80-14317
KLIMAS, P. C. N80-14538
KLOVSTAD, J. N80-14315
KLUEPFEL, R. J. N80-14206
KNOX, C. E. N80-14114
KOBAYASHI, N. N80-14910
KOCK, R. N80-14292
KOEHL, B. G. N80-14967
KOEPF, G. A. N80-14384
KOIKE, F. N80-14920
KOKINI, K. N80-14342
KOLBLY, R. B. N80-14157
KOMORI, A. N80-14914
KOONTZ, A. E. N80-14686
KORTE, U. N80-14141
KORTELA, I. M. N80-14713
KOSS, M. N80-14276
KOSSEY, P. A. N80-14321
KOSTUK, R. K. N80-14507
KOVALEV, Y. A. N80-15023
KOWALSKI, B. R. N80-14216
KOZO, T. L. N80-14632
KRAMLICH, D. N80-14964
KRASNOPOLSKY, V. A. N80-15018
KRAUSE, P. C. N80-14487
KREINER, J. H. N80-14412
KRESKOVSKY, J. P. N80-14356
KRIKORIAN, O. H. N80-14571
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L

LABARBERE, M. N00-14024
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M

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MISERENTINO, R. N00-14371
MIYAMOTO, K. N00-14915
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MOFFETT, R. N. N00-14130
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MORLEY, T. A. N00-14166
MORRIS, J. W., JR. N00-14239
MORRIS, P. W. N00-14423
MORRISON, G. E. S. N00-14029
MORRISON, R. B. N00-14131
MORSE, F. H. N00-14545
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MUELLER, A. H. N00-14896
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MUELLER, R. I. N00-14474
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MUPSON, S. N00-14988
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MURTHY, K. S. N00-14595
MYERS, A. N00-14039
MYERS, W. A. N00-14596

N

NACK, H. N00-14595
NAHRATH, R. N00-14925
NANCE, H. N00-14153
NARDUCCI, L. M. N00-14391
NAUDE, G. N00-14809
NEALE, J. N00-14960
NEARHOOF, S. L. N00-14481
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NEL, O. C. N00-14804
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NESS, W. G. N00-14036
NESTOR, D. A. N00-14663
NEUBAUER, H. G. N00-14462
NGUYEN, L. T. N00-14136
NICOLET, W. N00-14184
NITTINGER, R. J. N00-14274
NIZ, K. C. N00-14602
NOEL, G. T. N00-14483
NORRIS, J. R. N00-14228
NORTHROP, R. N00-14696
NORUM, T. D. N00-14868
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NYHOLM, R. A. N00-14585

O

OBRIEN, M. T. N00-14779
OCONNOR, W. F. N00-14756
ODLAND, B. N00-14520
ODOARDI, F. N00-14077
OFFERGINS, R. P. N00-14034
OGASAWARA, M. N00-14913
OGBURN, M. E. N00-14136
OGDEN, G. D. N00-14720
OH, B. Y. N00-14890
OHARE, S. N00-14803
OHTANI, S. N00-14912
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OKADA, S. N00-14919
OKAMOTO, M. N00-14918
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OKSMAN, J. N00-14611
ONKARAM, B. N00-14691
ORLOFF, K. L. N00-14049
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ORTH, P. N00-14106
OSINA, P. J. N00-14930

OSTER, J. R. N80-14681
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OTSUKI, H. H. N80-14571
OTTERSON, D. A. N80-14581
OTTO, R. J. N80-14226
OZBEK, H. N80-14226

P

PACHTER, M. N80-14830
PAGLIABULO, R. P. N80-14317
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PALMER, C. H. N80-14854
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PALUMBO, B. N80-14091
PAN, J. D. N80-14948
PAO, J. L. N80-14052
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PARABONI, A. N80-14089
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PARKER, R. N80-14590
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PARTLOW, D. P. N80-14252
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PEACHE, M. A. N80-14596
PEARSON, M. N80-14356
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PEASLEE, D. C. N80-14890
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PINES, S. N80-14164
PINNICK, R. G. N80-14653
PINSON, J. D. N80-14506
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PLEVIN, J. N80-14469
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POLLACK, F. G. N80-14374
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PRODAN, J. N80-14640
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PROKSOVA, E. N80-14671
PRYKE, I. N80-14449

Q

QUINN, D. W. N80-14853

R

RABINOVITCH, B. S. N80-14680
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N80-14769
N80-14770
N80-14771
N80-14772
N80-14773
N80-14774
N80-14775
N80-14776
N80-14777
N80-14778
N80-14779
N80-14780
N80-14781
N80-14782
N80-14783
N80-14784
N80-14785
N80-14786
N80-14787
N80-14788
N80-14789
N80-14790
N80-14791
N80-14792
N80-14793
N80-14794
N80-14795
N80-14796
N80-14797
N80-14798
N80-14799
N80-14800
N80-14801
N80-14802
N80-14803
N80-14804
N80-14805
N80-14806
N80-14807
N80-14808
N80-14809
N80-14810
N80-14811
N80-14812
N80-14813
N80-14814
N80-14815
N80-14816
N80-14817
N80-14818
N80-14819
N80-14820
N80-14821
N80-14822
N80-14823
N80-14824
N80-14825
N80-14826
N80-14827
N80-14828
N80-14829
N80-14830
N80-14831
N80-14832
N80-14833
N80-14834
N80-14835
N80-14836
N80-14837
N80-14838
N80-14839
N80-14840
N80-14841
N80-14842
N80-14843
N80-14844
N80-14845
N80-14846
N80-14847
N80-14848
N80-14849
N80-14850
N80-14851
N80-14852
N80-14853
N80-14854
N80-14855
N80-14856
N80-14857
N80-14858
N80-14859
N80-14860
N80-14861
N80-14862
N80-14863
N80-14864
N80-14865
N80-14866
N80-14867
N80-14868

S

SACCO, V. N80-14100
SAEKI, B. H. N80-14314
SAITTO, A. N80-14091
SAKAI, J. N80-14910
SALIBA, M. N80-14073
SALMON, T. N80-14218
SALTONSTALL, R. N80-14520
SAMUEL, S. A. N80-14932
SAMURIN, N. A. N80-14536
SANDERS, B. W. N80-14123
N80-14124
N80-14749
SANDHU, S. N80-14184
SANNINO, M. N80-14084
SANSONETTI, J. E. N80-14933
SANTINI, D. J. N80-14954
SANTORO, G. J. N80-14234
SARLABOUX, J. N80-14201
SARLANIS, K. N80-14795
SASAKI, T. N80-14912
SASSANO, A. N80-14071
SATO, I. N80-14917
SATO, K. N80-14919
SATO, M. N80-14915
SATO, N. N80-14914
SATZER, W. N80-14303
SAVAGE, W. F. N80-14040
SAYEED-UR-RAHMAN N80-14369
SCHAAF, G. B. N80-14162
SCHACHTER, H. N80-14324
SCHAINBLATT, A. H. N80-14276
SCHEIDMER, J. P. N80-14419
SCHERER, K. N80-14689
SCHEWE, G. N80-14368
SCHIFLETT, S. G. N80-14746
SCHLIVE, J. N80-14413
SCHITTENHELM, R. N80-14432
SCHLADITZ, D. M. N80-14198
SCHLADITZ, H. J. N80-14198
SCHLOSBERG, W. H. N80-14411
SCHMITZ, F. H. N80-14107
SCHNEIDER, B. N80-14708
SCHOCH, K. F., JR. N80-14251
SCHRAMM, W. G. N80-14666
SCHREIER, E. J. N80-14997
SCHREINER, F. N80-14265
SCHRICK, K. W. N80-14433
SCHROTT, A. N80-14328
N80-14789
N80-14819
SCHUBERT, F. H. N80-14718
SCHUELER, L. N80-14799
SCHULZE, W. N80-14794
SCHUMAKER, D. L. N80-14902
SCHUNCK, H. N80-14818
SCHUTZ, D. N80-14422
SCHWANE, J. C. H. N80-14703
SCHWARTZ, D. A. N80-14983
SCHWARTZ, M. W. N80-14973
SCHWARTZ, R. N80-14315
SCHWARZ, F. C. N80-14480
SCHWARZ, S. E. N80-14320
SCHWEMMER, E. N80-14960
SCIBILIA, M. F. N80-14060
N80-14370
SEAMONS, L. O. N80-14557
SEARCY, J. Q. N80-14565
SEASHOLTZ, R. G. N80-14375
SEBASTIAN, J. D. N80-14056
SEKIGUCHI, T. N80-14919
SELTZER, S. M. N80-14172
SELWYN, G. S. N80-14223
SENDALL, R. L. N80-14902
SETHIAN, J. D. N80-14834
SEWARD, F. D. N80-14996
SHAH, P. C. N80-14137
SHAH, S. P. N80-14277
SHAUGHNESSY, W. J. N80-14668
SHEFFIELD, J. S. N80-14048
SHEN, M. N80-14393
SHEPELEV, Y. Y. N80-14717
SHETTY, S. S. N80-14768
SHIELDS, J. R. N80-14536
SHILLIDAY, T. S. N80-14483
SHINGLU, E. N80-14385
SHORT, J. J. N80-14063
SIBOLD, J. D. N80-14485
SIEGEL, D. S. N80-14040
SIEVERS, M. W. N80-14158
SILLIMAN, W. J. N80-14351
SIMMONS, R. N80-14749
SIMONDS, C. H. N80-15013
SIMPSON, G. D. N80-14407
SIMPSON, J. G. N80-14473
SIMPSON, W. A. N80-14408
SINGH, J. J. N80-14771
SINHA, N. K. N80-14033
SIROVICH, L. N80-14814
SJODAHL, L. H. N80-14735
SLINEY, H. E. N80-14249
SMART, A. E. N80-14145
SMITH, A. M. N80-14944
SMITH, B. A. N80-14703

SMITH, G. A. N80-14090
SMITH, G. V. N80-14035
SMITH, H. M. N80-14038
SMITH, J. F. N80-14053
SMITH, J. M. N80-14022
SMITH, K. E. N80-14032
SMYRL, N. R. N80-14254
SMYTH, R. K. N80-14018
SOKOLOV, N. E. N80-14673
SOLI, N. E. N80-14731
SONDHARIYA, A. N80-14085
SONNORJAI, G. A. N80-14085
SOUTH, D. W. N80-14954
SOWELL, R. R. N80-14527
SOWERS, H. D. N80-14117
N80-14118
SPECTRO, D. N. N80-14834
SPERLING, R. B. N80-14594
SPRADLEY, L. N80-14354
SPRAGINS, J. D. N80-14318
SPREITER, J. R. N80-14652
SQUIRE, K. R. N80-14202
SRINIVASAN, S. N80-14522
N80-14526
SRIVASTAVA, R. D. N80-14265?
STACY, L. E. N80-14084
STALNAKER, W. A. N80-14055
STANLEY, A. G. N80-14332
STANLEY, J. E. N80-15006
STAUBERT, R. N80-15002
STEIN, V. N80-14790
N80-14820
N80-14821
STEINBERG, R. A. N80-14904
STEININGER, M. N80-14140
STEPHENSON, W. B. N80-14193
N80-14194
STERN, M. A. N80-14162
STEUNENBERG, R. K. N80-14530
STEVENS, M. L. N80-14400
STEVENSON, C. A. N80-14133
STEWART, S. R. N80-14458
STEWART, T. J. N80-14829
STEWART, W. N80-14106
STEWART, W. L. N80-14188
STIMPERT, D. L. N80-14115
STORZ, W. N80-14766
STOVER, C. W. N80-14624
STRACCA, G. B. N80-14293
N80-14296
STRAUB, D. K. N80-14250
STRAZISAR, A. J. N80-14250
N80-14375
STROSCHEIN, L. A. N80-14691
STRUTT, P. R. N80-14236
STUCKENBERG, N. N80-14023
STUFF, R. N80-14861
SUGIHARA, R. N80-14915
SUNDBERG, D. V. N80-14235
SUNYAEV, R. A. N80-15007
SUZUKI, H. N80-14912
N80-14920
SUZUKI, Y. N80-14912
SWEAZY, R. M. N80-14689
SWIFT, K. M. N80-14219

T

TAKAYANAGI, T. N80-14912
N80-14920
TALASKA, D. N80-14798
TANGORRA, A. N80-14066
TAYLOR, S. J. N80-14543
N80-14544
TEBBETS, I. N80-14692
TEJWANI, M. J. N80-14934
TENSI, J. N80-14059
TERRANOVA, T. N80-14689
TERRY, R. M. N80-14561
THEOBALD, J. K. N80-14394
THIBEAU, R. N80-14220
THODE, H. C., JR. N80-14586
THOMAS, G. N80-14239
THOMAS, R. K. N80-14483
THOMPSON, R. E. N80-14260
N80-14261
THOMPSON, R. G. N80-14230
THOMPSON, S. W. N80-14229
THURNAUER, M. C. N80-14228
TIBERIO, P. N80-14101
TIBERIO, U. N80-14082
TIERNEGO, M. J. L. N80-14034
TIERNEY, P. N80-14655
TIKU, S. K. N80-14943
TISON, R. R. N80-14263
TOMLINSON, P. G. N80-14302
TORGE, W. N80-14460
TORONTO, A. N80-14689
TOTH, W. J. N80-14578
TRAMBUSTI, M. N80-14092
TRIFFET, T. N80-14962
TRIFUNAC, A. D. N80-14228
TROLINGER, J. D. N80-14145
N80-14388
TROMPETTE, P. N80-14135
TRUEMPER, J. N80-14161
TRUONG, T. K. N80-14173
TSURUTANI, B. T. N80-14038
TUCKER, M. L. N80-14222
TULLY, F. P. N80-14651
TURKEL, B. S. N80-14535
TURNER, R. N80-14317
TURTLE, J. P. N80-14321

U

UHM, H. S. N80-14892
UHRIG, H. N80-14434
ULLAL, H. S. N80-14477
ULMER, D. H. N80-14898
ULMER, M. N80-14967
ULSETH, G. W. N80-14694
UPSHER, F. J. N80-14670
URBAN, L. V. N80-14669

V

VALDOIS, M. N80-14341
VALDONI, F. N80-14293
N80-14300
N80-14189
N80-14759
VALLER, H. W. N80-14804
VANAKEN, J. R. N80-14325
VANDERMERWE, A. J. N80-14379
VANKEUK, G. N80-14104
VANTINE, H. N80-14594
VATALARO, F. N80-14107
VAUGHAN, W. M. N80-14298
VAUSE, R. N80-14299
VECCHIO, L. L. N80-14092
N80-14200
VENTURI, V. N80-14716
VERBOEVEN, J. D. N80-14247
VERGO, V. V. N80-14095
VERMA, K. K. N80-14096
VERRAZZANO, L. N80-14097
N80-14098
N80-14353
VEZIROGLU, T. N. N80-14554
N80-14555
N80-14669
VILLAMAR, M. N80-14557
VITTITOE, C. N. N80-14888
VOGEL, P. N80-15002
VOGES, W. N80-14435
VOLKERT, J. N80-14737
VONBLUECHER, H. N80-14792
VONDERDECKEN, J. N80-14843
VONGLAHN, U. N80-14701
VONWENTERFELDT, D. N80-14042
VOUSDEN, P. B.

W

WADDEN, R. N80-14696
WAGNER, K. K. N80-14661
WAKIYA, K. N80-14912
N80-14920
WALDER, A. N80-14243
WALKER, D. N80-14501
WALSH, W. J. N80-14531
WALTER, D. N80-14521
WANG, P. W. N80-14935
WANG, W. S. N80-14338
WARD, D. S. N80-14569
WARD, G. K. N80-14382
WARD, S. N80-14712
WARD, S. L. N80-14795
WARNER, C. J. N80-14318
WARNER, J. L. N80-15013
WASAFF, S. K., JR. N80-14957
N80-14958
N80-14959
WATKINS, G. G. N80-14810
WATSON, J. H. N80-14026
WATTS, J. N80-14275
WEATHERILL, W. H. N80-14056
WEBB, J. D. N80-14219
WEBBY, J. P. N80-14038
WEBER, A. G. N80-14308
WEBER, W. N80-14436
N80-14437
N80-14142
WEGER, D. N80-14732
WEGER, N. P. N80-14040
WEHMAN, R. F. N80-14138
WEHREND, W. R., JR. N80-14311
WEINERT, H. L. N80-14379
WEINGART, R. N80-14578
WEISSBROD, R. N80-14995
WEISSKOPF, M. C. N80-14162
WELLER, R. W. N80-14883
WEMMER, D. F. N80-14460
WENZEL, H. G. N80-14622
N80-14058
WERNER, K. N80-14047
WERTH, J.

WESCOTT, P. L. N80-14038
WEST, B. G. N80-14782
WEST, T. J. N80-14615
WHEELER, D. R. N80-14232
WHETSTONE, G. A. N80-14469
WHETSTONE, W. D. N80-14212
WHITE, C. C. N80-14382
WHITE, I. L. N80-14463
N80-14464
N80-14465
N80-14466
N80-14467
N80-14468
WHITE, J. R. N80-14345
WHITE, K. J. N80-14215
WHITMORE, J. N80-14490
WHITNACK, G. C. N80-14343
WHITNEY, C. N80-14906
WICK, M. R. N80-14162
WIEDENHEFT, C. J. N80-14540
WIERWILLE, W. W. N80-14746
WIESENFELD, J. N80-14387
WILBORN, J. N80-14537
WILKERSON, T. E. N80-14960
WILLIAMS, J. G. N80-14051
WILLIAMS, L. A. N80-14395
WILLIGES, R. C. N80-14746
WILLIS, P. B. N80-14486
WILSDORF, H. G. F. N80-14198
WILSKI, I. N80-14438
WILSON, J. A. N80-14937
WIN-NIELSEN, A. N80-14660
WINEBARGER, R. N80-14305
N80-14306
WINELAND, D. L. N80-14577
WINKLER, P. F. N80-14990
WINSLOW, R. L. N80-14312
WISNOSKY, M. G. N80-14203
WITTENBERG, L. J. N80-14540
N80-14541
N80-14570
WOETZEL, G. N80-14439
WOLF, H. A. N80-14847
WOLFF, H. N80-14799
WOLFF, S. S. N80-14316
WOOD, B. E. N80-14944
WOOD, E. N80-14979
WOOD, R. E. N80-14936
WOOD, V. E. N80-14483
WOOD, W. D. N80-14637
WOODS, R. R. N80-14718
WRENCH, E. H. N80-14308
WRIGHT, D. U. N80-14608
WRIGHT, I. G. N80-14946
WRIGHT, P. G. N80-14784
N80-14785
WYMAN, C. N80-14546

X

XUAN, P. T. N80-14502

Y

YAGGEE, F. L. N80-14237
YAGISHITA, A. N80-14920
YANG, C. H. N80-14204
YASUI, R. K. N80-14474
YAVIN, Y. N80-14812
N80-14813
N80-14828
YAVROUIAN, A. N80-14609
YAWS, C. N80-14692
YIP, E. L. N80-14773
YOLDAS, B. E. N80-14252
YOO, H. I. N80-14273
YORK, W. L. N80-14560
YOUNG, G. K. N80-14668
YOUNGBERG, J. E. N80-14280
YOUNGLOVE, B. N80-14257
YOUSEY, W. J. N80-14026
YUEN, T. Y. S. N80-14580

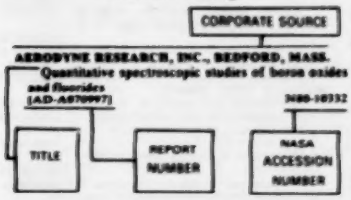
Z

ZACHAROV, S. B. N80-14360
ZALOTAI, L. N80-14880
ZANFORLIN, L. N80-14084
ZAPPA, G. N80-14074
ZELDOVICH, Y. B. N80-15007
ZELENY, L. M. N80-14929
ZERNECKE, R. N80-14461
ZIMA, G. E. N80-14223
ZIMMERMAN, J. E. N80-14423
ZIMMERMAN, W. N80-14956
ZIMMERMAN, W. F. N80-14484
ZOKAI, M. N80-14938
ZOMBECK, A. N80-14250

CORPORATE SOURCE INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 18 NUMBER 5

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The titles are arranged under each corporate source in ascending accession number order.

A

ABERDEEN PROVING GROUND, MD.
The effects of acute and chronic low dose exposure to anticholinesterases
N80-14729

ACADEMY OF SCIENCES [USSR], MOSCOW.
Anomalous electron thermal conductivity across destroyed magnetic surfaces
[PR-501] N80-14929
The velocity of clusters of galaxies relative to the microwave background. The possibility of its measurement
[PR-488] N80-15007
Noble gases in the atmosphere of Venus, Earth, and Mars. The problem of the origin of planetary atmospheres
[PR-482] N80-15017
Structure of the Mars lower and middle atmosphere based on Mars 5 ultraviolet photometry data
[PR-483] N80-15018

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Phase-locked telemetry system for rotary instrumentation of turbomachinery, phase I
[NASA-CR-159453] N80-14182
Galileo probe thermal protection: Entry heating environments and spallation experiments design
[NASA-CR-152334] N80-14184

ADDIS TRANSLATIONS INTERNATIONAL, PORTOLA VALLEY, CALIF.
Ultra-rapid electrooptical angular deflector operating in the nanosecond range: Applications
[UCRL-TRANS-11428] N80-14908

ADVANCED RESEARCH RESOURCES ORGANIZATION, WASHINGTON, D.C.
Methods for evaluating the physical and effort requirements of Navy tasks: Metabolic, performance, and physical ability correlates of perceived effort
[AD-A072497] N80-14720

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, NEUILLY-SUR-SEINE [FRANCE].
Advances in Guidance and Control Systems Using Digital Techniques
[AGARD-CP-272] N80-14017

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS [FRANCE].
Recent advances in Aeronautical and Space Medicine
[AGARD-CP-265] N80-14678
Problems related to medical criteria for the selection of military navigation personnel
N80-14679
Maintenance of air operations while under attack with chemical agents
[AGARD-CP-264-SUPPL] N80-14728
Survey of methods to assess workload
[AGARD-AG-246] N80-14739
Special Course on Acoustic Wave Propagation
[AGARD-R-686] N80-14858

AEROJET LIQUID ROCKET CO., SACRAMENTO, CALIF.
Performance of a transpiration-regenerative cooled rocket thrust chamber
[NASA-CR-159742] N80-14189

AERONAUTICA MILITARE ITALIANA, ROME.
Problems related to the design and construction of a radar network
N80-14066

AERONAUTICAL SYSTEMS DIV., WRIGHT-PATTERSON AFB, OHIO.
Aeronautical systems technology needs: Escape, rescue and survival
[AD-A074906] N80-14061

AEROSPACE CORP., EL SEGUNDO, CALIF.
The 10 MW solar thermal pilot plant dynamic simulation. Volume 1: Computer program description
[ATR-78(7747)-1-VOL-1] N80-14550
The 10 MW solar thermal pilot plant dynamic simulation. Volume 2: Computer program source listing
[ATR-78-(7747)-2-VOL-2] N80-14551

AEROSPACE ENGINEERING TEST ESTABLISHMENT, COLD LAKE [ALBERTA].
Determination of the repeatability of PEC
[AETE-PR-79/36] N80-14109

AEROSPACE GUIDANCE AND METROLOGY CENTER, NEWARK AIR FORCE STATION, OHIO.
Laser power meter intercomparison test evaluated by two variable linear regression analysis
[AD-A074526] N80-14389

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Derivation of presbycusis and Noise Induced Permanent Threshold Shift [NIPTS] to be used for the basis of a standard on the effects of noise on hearing
[AD-A071310] N80-14690
Effect of peripherally presented visual signals on pilot performance during flight simulation
[AD-A073604] N80-14703
Time simulation of an air surveillance task with varying amounts of radar information
[AD-A074866] N80-14722
USAF bioenvironmental noise data handbook. Volume 125: F-105D aircraft, near and far-field noise
[AD-A073616] N80-14848
USAF bioenvironmental noise data handbook. Volume 129: F-100 aircraft in the AF32A-36 noise suppressor, near and far-field noise
[AD-A073793] N80-14849
USAF bioenvironmental noise data handbook. Volume 137: F-101B aircraft, near and far-field noise
[AD-A073617] N80-14850
USAF bioenvironmental noise data handbook. Volume 138: F-102A aircraft, near and far-field noise
[AD-A073618] N80-14851

AIR FORCE ENGINEERING AND SERVICES CENTER, TYNDALL AFB, FLA.
An evaluation of the bird/aircraft strike hazard at Barksdale Air Force Base, Louisiana [SAC]
[AD-A074390] N80-14063

AIR FORCE FLIGHT DYNAMICS LAB., WRIGHT-PATTERSON AFB, OHIO.
A flight control system using the DAIS architecture
N80-14019
Integration of flight and fire control
N80-14043
The analysis of sound propagation in jet engine ducts using the finite difference method
[AD-A074233] N80-14853

AIR FORCE GEOPHYSICS LAB., HANSCOM AFB, MASS.
Proceedings of the 10th AFGL Scientific Balloon Symposium
[AD-A074469] N80-14057
ATS-5 and ATS-6 potentials during eclipse
[AD-A074878] N80-14170
The current status of predictions of low energy plasma interactions with space systems
[AD-A074523] N80-14186

AIR FORCE ROCKET PROPULSION LAB., EDWARDS AFB, CALIF.
Assessment of in situ diagnostics for application to rocket propulsion problems
[AD-A075320] N80-14190

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Approaches to CW agent area detection systems for airfields
N80-14733
Philosophy of protection of US aircrews against chemical warfare agents
N80-14734
US aircrew chemical defense ensembles
N80-14736
Integration of protection against chemical warfare agents with aircrew personal equipment
N80-14738
Workload assessment methodology development
N80-14747

AIR POLLUTION TECHNOLOGY, INC., SAN DIEGO, CALIF.
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 1
[PB-299191/7] N80-14590
Effects of conditioning agents on emissions from coal-fired boilers: Test report no. 2
[PB-299192/5] N80-14591

AIR TRANSPORT ASSOCIATION OF AMERICA, WASHINGTON, D.C.
Needed weather information where it belongs, in the cockpit
N80-14635

AIRESEARCH MFG. CO., PHOENIX, ARIZ.
Advanced compressor and turbine seals, volume I
[NASA-CR-159603] N80-14235
Contact stress analysis of ceramic-to-metal interfaces
[AD-A074491] N80-14417

ALASKA UNIV., COLLEGE.
Operation of a telemetered seismic network on the Alaska Peninsula
[DOE/ER-70006-6] N80-14619

ALFRED UNIV., N.Y.
Effect of silver on the structure and properties of arsenic-trisulfide glass
N80-14247

AMES LAB., IOWA.
Graphite morphologies in the solidification of high purity Fe-C-Si alloys
[IS-4693] N80-14200
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system
[IS-M-212] N80-14953

AMHERST SYSTEMS, INC., BUFFALO, N.Y.
Image processing system software. Volume 1: Users manual
[AD-A073652] N80-14775
Image processing system software. Volume 2: Programmers manual
[AD-A073653] N80-14776

ANALYTICAL MECHANICS ASSOCIATES, INC., JERICHO, N.Y.
Research in navigation and optimization for space trajectories
[NASA-CR-160420] N80-14164

ANOCUT ENGINEERING CO., CHICAGO, ILL.
Apparatus for electrolytically tapered or contoured cavities
[NASA-CASE-XNP-08835-1] N80-14395

ANTHROPOLOGY RESEARCH PROJECT, YELLOW SPRINGS, OHIO.
Anthropometric sizing, fit-testing and evaluation of the MBU-12/P oral-nasal oxygen mask
[AD-A074723] N80-14692
Design criteria for characterizing individuals in the extreme upper and lower body size ranges
[AD-A072553] N80-14721

APPLETON LAB., SLOUGH [ENGLAND].
Sun-weather relationships: A branch of solar-terrestrial physics
N80-14613

APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., LAUREL, MD.
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[PB-298785/7] N80-14578

ARGONNE NATIONAL LAB., ILL.
Electron spin echo spectroscopy and photosynthesis
[CONF-780741-4] N80-14228
Iodine stress-corrosion cracking in irradiated Zircaloy cladding
[CONF-790441-7] N80-14237
Microstructural observations on time-dependent failure in weld-deposited Type 16-8-2 stainless steel
[CONF-780834-2] N80-14240

High-BTU coal gasification processes
[ANL/CES/TE-79-3] N80-14263
Experimental verification of the mercury-iodine thermochemical cycle for the production of hydrogen from water, ANL-4
[CONF-780907-11] N80-14265
Fourteen species: Their potential for transforming biomass to ethanol
[ANL/EES-TM-38] N80-14271
Numerical methods for a porous medium equation
[ANL-79-80] N80-14365
Definition and analysis of the barriers to the implementation of urban energy recovery systems
[ANL/CNSV/TM-2] N80-14523
Lithium/metal sulfide battery development
[CONF-790538-10] N80-14530
Advanced batteries for electric vehicles: A look at the future
[CONF-790484-1] N80-14531
Overview of the Department of Energy's research, development and demonstration program for the recovery of energy and materials from urban waste
[CONF-790373-1] N80-14562
Review of industrial participation on the ANL lithium/iron sulfide battery development program
[CONF-790853-1] N80-14573
Interaction of fast molecular ions with matter
[CONF-790504-8] N80-14889
Distribution and classification of local socio-economic impacts from energy development
[CONF-790481-1] N80-14954
Regenital layering processes based on studies of low-temperature volatile elements in Apollo core samples
[CONF-790981-1] N80-15016
ARINC RESEARCH CORP., ANNAPOLIS, MD.
Operating manual for the Dynamic Test Set (DTS) for the low voltage power supply part of the AN/ALQ-119 V electronic countermeasures system
[AD-A074894] N80-14345
ARINC RESEARCH CORP., SANTA ANA, CALIF.
Avionics installation [AVSTALL] cost model for user equipment of NAVSTAR global positioning system
[AD-A073681] N80-14106
ARIZONA STATE UNIV., TEMPE.
Rule learning and systematic instruction in pilot training
[AD-A068906] N80-14709
ARIZONA UNIV., TUCSON.
Extrapolation techniques for the evaluation of digital communications equipment
N80-14282
Fugitive and fine particle control using electrostatically charged fog
[PB-298069/6] N80-14593
West Coast Forum on Appropriate Technology
[PB-298096/7] N80-14962
ARKANSAS UNIV., FAYETTEVILLE.
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[NASA-CR-162562] N80-14900
ARMED FORCES RADIOBIOLOGY RESEARCH INST., BETHESDA, MD.
Early transient incapacitation: A review with consideration of underlying mechanisms
[AD-A071803] N80-14693
ARMY AEROMEDICAL RESEARCH LAB., FORT RUCKER, ALA.
Visual performance: A method to assess workload in the flight environment
N80-14749
ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND, HAMPTON, VA.
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations
[NASA-TP-1608] N80-14840
ARMY CONCEPTS ANALYSIS AGENCY, BETHESDA, MD.
Management Analysis of Key Resource Operations [MAKRO], volume 1
[AD-A069016] N80-14957
Management analysis of Key Resource Operations [MAKRO]. Volume 2, Appendix E: Networks. Annex 1 and 2: Planning and programming
[AD-A069017] N80-14958
Management Analysis of Key Resource Operations [MAKRO]. Volume 3, Appendix E: Networks. Annex 3: Budget formulation
[AD-A069018] N80-14959
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Survey of solidification/stabilization technology for hazardous industrial wastes
[PB-299206/3] N80-14278
ARMY MATERIEL SYSTEMS ANALYSIS ACTIVITY, ABERDEEN PROVING GROUND, MD.
A computer program for estimation of parameters of the Weibull intensity function and for the Cramer-Von Mises goodness of fit test
[AD-A074704] N80-14777
ARMY MILITARY PERSONNEL CENTER, ALEXANDRIA, VA.
A study in procedural manipulation of locus of control
[AD-A068658] N80-14704
ARMY MISSILE MATERIAL READINESS COMMAND, REDSTONE ARSENAL, ALA.
Target missile airframe costs
[AD-A073314] N80-14112
ARMY RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NATICK, MASS.
Three instruments for assessment of WBGT and a comparison with WGT [BOTSBALL]
[AD-A074979] N80-14691
ARMY TEST AND EVALUATION COMMAND, ABERDEEN PROVING GROUND, MD.
US Army Test and Evaluation Command test operations procedures: Photographic and video image support aviation materiel
[AD-A074813] N80-14377
Infrared measurements of vehicles and weapons
[AD-A074817] N80-14905
ARMY TROPIC TEST CENTER APO, MIAMI 34004.
Methodology investigation exposure/performance test of selected material items
[AD-A074003] N80-14406
ARO, INC., ARNOLD AIR FORCE STATION, TENN.
Application of the multistage axial-flow compressor time-dependent mathematical modeling technique to the TF41-A-1 modified block 76 compressor
[AD-A074078] N80-14134
Bipropellant engine plume contamination program. Volume 3: Performance predictions for the AJ10-181 bi-propellant rocket engine using the CONTAM/TCC code
[AD-A074914] N80-14193
Contamination measurements from a 5 lb sub F thrust bipropellant engine, phase 2
[AD-A073871] N80-14194
IR optical properties of thin H2O, NH3, and CO2 cryofilms
[AD-A074913] N80-14944
ATLANTA AIR ROUTE TRAFFIC CONTROL CENTER, HAMPTON, GA.
Atlanta Air Route Traffic Control Center's involvement in aviation weather
N80-14637
ATMOSPHERIC SCIENCES LAB., WHITE SANDS MISSILE RANGE, N. MEX.
Relationships between ir extinction, absorption and liquid water content of fogs
[AD-A074395] N80-14653
AVCO LYCOMING DIV., WILLIAMSPORT, PA.
Exhaust emission reduction for intermittent combustion aircraft engines
[NASA-CR-159757] N80-14130
AVCO SYSTEMS DIV., WILMINGTON, MASS.
Protective coatings for aircraft composites in nuclear environments
[AD-A074889] N80-14199

B

BALLISTIC RESEARCH LABS., ABERDEEN PROVING GROUND, MD.
Electron spin resonance studies of hydrogen and deuterium bombardment of unsaturated hydrocarbons at 77K
[AD-A074264] N80-14215
A new class of optical communication systems. I: Experiment
[AD-A074313] N80-14316
BATTELLE COLUMBUS LABS., OHIO.
Development of an accelerated test design for predicting the service life of the solar array at Mead, Nebraska
[NASA-CR-162534] N80-14483
Environmental assessment of the fluidized-bed combustion of coal: Methodology and initial results
[PB-298473/0] N80-14595
Influence of stoichiometry on impingement erosion of lead sulfide and zinc selenide
[AD-A073955] N80-14946
Annual summary of technical awareness in the nonferrous metals industry
[PB-299285/7] N80-14967
BATTELLE MEMORIAL INST., COLUMBUS, OHIO.
Arc-tunnel stagnation enthalpy measurements utilizing the copper-line-ratio method corrected for self-absorption effects
[AD-A074635] N80-14146
BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WASH.
Evaluation of potential chemical/mechanical degradation processes affecting fuel and structural materials under long-term water storage
[NUREG-CR-0668] N80-14223
Simultaneous mass detection for direct inlet mass spectrometry
[PNL-2728] N80-14227
Compressed air energy storage technology program
[PNL-2935] N80-14534
BENDIX CORP., KANSAS CITY, MO.
Development of a comparative analyzer for microprocessor
[BDX-613-2060-REV] N80-14785
BIONETICS CORP., HAMPTON, VA.
The transfer of carbon fibers through a commercial aircraft water separator and air cleaner
[NASA-CR-159183] N80-14359
BIOTECHNOLOGY, INC., FALLS CHURCH, VA.
Navy combat search and rescue
[AD-A074503] N80-14682
BLOCK ENGINEERING, INC., CAMBRIDGE, MASS.
The 0.1 wavenumber spectral measurements in the region from 2050 - 2410 wavenumbers of a static, experimental rocket motor at three pressure altitudes
[AD-A073704] N80-14191
BLUECHER G.M.B.H. DUESSELDORF [WEST GERMANY].
FRG airborne chemical defence assemblies
N80-14737
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
An investigation of several factors involved in a finite difference procedure for analyzing the transonic flow about harmonically oscillating airfoils and wings
[NASA-CR-159143] N80-14056
Linear systems analysis program, L224[QR], Volume 1: Engineering and usage
[NASA-CR-2861] N80-14137
FORTRAN subroutines for out-of-core solutions of large complex linear systems
[NASA-CR-159142] N80-14773
BOLOGNA UNIV. [ITALY].
Architecture and analysis of the performance of the data processor for the sensor channel of a Discrete Address Beacon System
N80-14301
Propagation in circular waveguides
N80-14294
Problems and installation technique of the transmitting modes of a circular waveguide link
N80-14298
Measurement and characterization of manufacturing and installation imperfections of circular waveguides
N80-14299
BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Speech communication and synthesis
[AD-A074497] N80-14315
BOSTON UNIV., MASS.
Photoassociation mechanisms for energy storing interrelations
[AD-A074968] N80-14502
Energy storing organic photoreactions
[AD-A074915] N80-14503
BRISTOL UNIV. [ENGLAND].
Crop environment monitoring: The remote sensing systems
N80-14452
Practical exercise on the analysis of visible and infrared images from NOAA-5
N80-14453
Crop environment monitoring: The assessment of environmental phenomena using satellite remote sensing data
N80-14454
Crop monitoring and prediction using satellite data
N80-14455
Satellite remote sensing in hazard monitoring and disaster evaluation
N80-14456
Satellite remote sensing for agricultural advisories and planning
N80-14457
BRITISH AEROSPACE DYNAMICS [SPACE], STEVENAGE [ENGLAND].
Parameter estimation from satellite tracking data
[ESS/SS-919] N80-14166
BRITISH BROADCASTING CORP., KINGSWOOD [ENGLAND].
Ground-wave propagation in a realistic terrain
[BBC-RD-1979/19] N80-14286
Local oscillator radiation from television receivers
[BBC-RD-1979/21] N80-14287
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Highlights of the energy technology programs
[BNL-50939] N80-14512
Dynamic energy system optimization model
[EPRI-EA-1079] N80-14514
Solid electrolyte fuel cell for electric power generation
[BNL-26238] N80-14522
Evaluation of performance enhancement of solar powered absorption chiller with an improved control strategy using the BNL-built hardware simulator
[BNL-26218] N80-14552
Interrelationships between man, energy, and water quality: A new methodology for integrative analyses
[BNL-26188] N80-14586
High resolution magnetic spectrometer for antiproton physics at rest and low energies
[BNL-24662] N80-14890
Superconducting magnets in high energy physics
[BNL-24818] N80-14897
BROWN UNIV., PROVIDENCE, R. I.
Approximate and exact numerical integration of the gas dynamic equations
[NASA-CR-162556] N80-14814
BURT, HILL, KOSAR, RITTLEMAN, AND ASSOCIATES, BUTLER, PA.
Residential photovoltaic module and array requirements study, appendices
[NASA-CR-162529] N80-14481
Residential photovoltaic module and array requirements study
[NASA-CR-162528] N80-14482

C

CALCULON CORP., PHILADELPHIA, PA.
Comparison of high speed printer interface characteristics
[PB-299943/2] N80-14767

CALIFORNIA INST. OF TECH., PASADENA.
Capture of muons in atoms
[CALT-63-304] N80-14888
The scientific results of the low energy portion of A-2
N80-14980

CALIFORNIA UNIV., BERKELEY.
High strength austenitic alloys for generator retaining rings
[EPRI-FP-1061] N80-14239
Antenna-coupled infrared detectors
[AD-A074085] N80-14320
Infrared laser window coating by plasma polymerization
[AD-A075008] N80-14393
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles, volume I
[PB-299105/7] N80-14974
An investigation of the reprocessing and waste management requirements of present and alternative nuclear fuel cycles. Volume 2: Appendices
[PB-299106/5] N80-14975

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Ultraviolet spectroscopy of nitrous oxide (N_2O): A temperature-resolved study
[LBL-8739] N80-14225
Basic energy properties of electrolytic solutions database
[LBL-7827] N80-14226
Energy-dependent losses in pulsed-feedback preamplifiers
[LBL-8135] N80-14348
Proceedings of the Thermal Energy Storage in Aquifers Workshop
[LBL-8431] N80-14533
Thermal degradation of a black chrome solar selective absorber coating: Short term
[LBL-8857] N80-14549
Catalysis and surface science
[LBL-9043] N80-14885
Photodissociation processes in molecular beams
[LBL-9219] N80-14886
Statistical mechanics and field theory
[LBL-9168] N80-14952

CALIFORNIA UNIV., DAVIS.
Pilot plant gasification test on biomass fuels
[PB-299077/5] N80-14272
Wind field analyses of severe storms for COMPASS [Cooperative Observational and Modeling Project for the Analysis of Severe Storms]
[PB-300298/7] N80-14661

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Characterization of DC-S-2000 silicone rubber as an O-ring material for laser amplifier systems
[UCRL-52688] N80-14253
Heats and products of detonation of TNT under varying conditions of confinement and density
[UCID-18211] N80-14267
Low impedance manganin stress gauge system for severe shock wave environments
[UCRL-81605] N80-14379
Photoacoustic stress
[UCRL-82394] N80-14419
US energy flow in 1978
N80-14517
Non-tracking inflated cylindrical solar concentrator
[UCRL-82721] N80-14528
Lawrence Livermore Laboratory geothermal energy program: A status report on the development of the Total-Flow concept
[UCRL-50046-77] N80-14529
Process design and economic analysis of the zinc telenide thermochemical hydrogen cycle
[UCRL-52546] N80-14571
Imperial Valley environmental project: Air quality assessment
[UCRL-52699] N80-14585
Measurement of sound velocity in liquid metals
[UCID-18171] N80-14857
Some double resonance and multiple quantum NMR studies in solids
[LBL-8042] N80-14883
Formation of hydrogen negative ions by surface and volume processes with application to negative ion sources
[UCRL-82889] N80-14887
Assessment of the applicability of mechanical energy storage devices to electric and hybrid vehicles. Volume 1: Executive summary
[UCRL-52773-VOL-1] N80-14973

CALIFORNIA UNIV., LOS ANGELES.
Error control systems for multi-access communication channels
[AD-A074569] N80-14314
Hydrodynamical aspects of low flow vapor injection into subcooled water
N80-14353
The electron-phonon interaction spectrum in proximity effect copper
N80-14937
Assessment of technology for information services planning
[AD-A073315] N80-14963

CALIFORNIA UNIV., RIVERSIDE.
The interaction of cumic with the human erythrocyte
N80-14686

CALIFORNIA UNIV., SAN DIEGO.
Kinematic analysis of osmotic processes under non-equilibrium conditions
N80-14669
A-4 scientific results
N80-14985

CALIFORNIA UNIV. AT LOS ANGELES.
Papillometric methods of workload evaluation: Present status and future possibilities
N80-14752

CALLERY CHEMICAL CO., PA.
Carbocane synthesis
[AD-A074570] N80-14217

CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
A regular layout for parallel adders
[AD-A074455] N80-14764
A study on selected wideband guided-wave acoustooptic and electrooptic devices
N80-14899

CENTRE NATIONAL D'ETUDES SPATIALES, TOULOUSE [FRANCE].
French space programs
N80-14165

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, MARSEILLES [FRANCE].
Random propagation and random scattering
N80-14871
Underwater acoustic problems
N80-14872

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, TOULOUSE [FRANCE].
Definition of the hierarchical network for aggressive environments [RHEA]
N80-14030

CENTRE OCEANOLOGIQUE DE BRETAGNE, BREST [FRANCE].
The ANTIPROD-1 campaign on board the Marion Dufresne, 1-28 March 1977.
[CNEXO-16-1978] N80-14667

CENTRO PER LA RICERCA ELETTRONICA IN SICILIA, MONREALE [ITALY].
Phase-locking in power oscillators
N80-14085

CENTRO STUDI E LABORATORI TELECOMUNICAZIONI, TURIN [ITALY].
Design of the transmission media of circular waveguides
N80-14295
Special passive components for circular waveguides
N80-14297
Measuring methods of the electromagnetic characteristics of circular waveguides
N80-14300
Measuring methods of repeater characteristics for circular waveguide systems
N80-14301

CESKOSLOVENSKA AKADEMIE VED, PRAGUE.
National report: Meteorology for 1975-1979
N80-14649

CHAMBER OF COMMERCE, HOUSTON, TEX.
Houston area oxidants study, program summary
[PB-299638/7] N80-14598

CIVIL AEROMEDICAL INST., OKLAHOMA CITY, OKLA.
Workload and stress in air traffic controllers
N80-14757

COAST GUARD RESEARCH AND DEVELOPMENT CENTER, GROTON, CONN.
Evaluation of solar photovoltaic arrays for use on marine aids to navigation
[AD-A074893] N80-14507

COLORADO STATE UNIV., FORT COLLINS.
Two photon spectroscopy of pyrazine and triazine
[AD-A074055] N80-14219
Performance of residential solar heating and cooling systems with flat-plate and evacuated tubular collectors: CSU solar house 1
[COO-2577-16] N80-14568
Realistic sizing of residential solar heating and cooling systems
[COO-2859-14] N80-14569
Interaction of high voltage surfaces with the space plasma
[NASA-CR-159731] N80-14923

COLORADO UNIV., BOULDER.
A generalized sidelobe canceling structure for adaptive arrays
[AD-A074899] N80-14319

COLUMBIA UNIV., NEW YORK.
Ordering of atomic energy levels in excited states
[CU-TP-135] N80-14884
High energy hadron-nucleus collisions
[CU-TP-137] N80-14896
Columbia/Einstein observations of galactic X-ray sources
[CONTRIB-179] N80-14999
Columbia/Einstein observations of extragalactic X-ray sources
[CONTRIB-180] N80-15000

COMITE NATIONAL FRANCAIS DE RECHERCHES DANS L'ESPACE, PARIS.
French space programs
N80-14165

COMMISSION OF THE EUROPEAN COMMUNITIES, LUXEMBOURG.
Environment and the quality of life
[EUR-5970] N80-14582

COMMITTEE ON SCIENCE AND TECHNOLOGY [U. S. HOUSE].
Severe storms research
[GPO-52-135] N80-14650
The Space Industrialization Act of 1979
[GPO-50-404] N80-14970

COMMUNICATIONS RESEARCH CENTRE, OTTAWA [ONTARIO].
VHF and UHF propagation studies in the Canadian Arctic
[CRC-1327] N80-14288

COMPAGNIA ITALIANA SERVIZI TECNICI, ROME.
Organization of an integrated global maintenance service
N80-14069
Analysis of the Side Lobe Suppression [SLS] and Receive Side Lobe Suppression [RSLS] functions of secondary radar
N80-14098

COMPUTER CORP. OF AMERICA, CAMBRIDGE, MASS.
Spatial data management system
[AD-A068963] N80-14964

COMPUTER SCIENCES CORP., FALLS CHURCH, VA.
Earth terminal subsystem study. Volume 1: Small terminal cost analysis
[AD-A073429] N80-14305
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers
[AD-A073356] N80-14306

COMPUTER SCIENCES CORP., HUNTSVILLE, ALA.
A mind/brain/matter model consistent with quantum physics and UFO phenomena
[AD-A069988] N80-14711

CONNECTICUT UNIV., STORRS.
Surface hardening by laser skin melting
[AD-A074166] N80-14236
AFOSR Workshop in Communication Theory and Applications
[AD-A074299] N80-14313

CONSIGLIO NAZIONALE DELLE RICERCHE, FLORENCE [ITALY].
An air traffic channel simulation by means of ray-tracing techniques
N80-14088
L-band measurements in the air traffic channel to characterize secondary radar systems
N80-14092

CONSIGLIO NAZIONALE DELLE RICERCHE, PISA [ITALY].
Simulation of a surveillance and control system of surface traffic in an airport
N80-14073

CONSIGLIO NAZIONALE DELLE RICERCHE, ROME [ITALY].
Automation of flight on-line strategic control: The case of speed control on pre-established routes
N80-14070
Radar data utilization in automating the sequencing of aircrafts in terminal areas
N80-14071
Tactical analysis of conflicts in an air traffic control system: Design and implementation of a provisional model
N80-14072
Comparison between the first pluviometric data obtained with an S-band radar and attenuation data at 11.6 GHz obtained simultaneously by means of the SIRIO satellite
N80-14089

CONSOLIDATED CONTROLS CORP., EL SEGUNDO, CALIF.
Low temperature latching solenoid
[NASA-CASE-MSC-18106-1] N80-14338

CONTRAVES ITALIANA, ROME.
Digital signal processing techniques in a monopulse tracking radar
N80-14035

CONTROL DYNAMICS CO., HUNTSVILLE, ALA.
Application of discrete guidance and control theory
[AD-A074782] N80-14172

COORS PORCELAIN CO., GOLDEN, COLO.
Development of mullite substrates and containers
[NASA-CR-162543] N80-14485

CORNELL UNIV., ITHACA, N. Y.
Substructure and properties of sodium beta alumina solid electrolytes
[EPRI-FP-1058] N80-14224
Kinetic aspects of gas phase metal atom oxidation reactions
[AD-A074089] N80-14387

A utilization of the nested grid approach in the development of a severe weather index
N80-14627
Randomization procedures for a two way analysis of orientation data
N80-14624
High frequency broadband rotor noise
N80-14830
CORNELL UNIV., NEW YORK.
Instability of gravity waves in a shear flow
N80-14607
Langmuir circulations as a convective instability mechanism and its effect on the ocean mixed layer
N80-14662

D

DAMES AND MOORE, LOS ANGELES, CALIF.
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1971/1978. Volume 2-A: Compendium of work element reports
[PB-299686/9] N80-14588
The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey, MAFLA, 1971/1978. Volume 2-B: Compendium of work element reports
[PB-299687/7] N80-14589
DAYTON UNIV., OHIO.
Feasibility of utilizing laser Doppler velocimeter techniques in very close wind tunnels
[AD-A078244] N80-14145
Development and application of a laser velocimeter to measure very high speed particle velocities
[AD-A078859] N80-14588
Analysis of remote site energy storage and generation systems
[AD-A078869] N80-14504
DECISION-SCIENCE APPLICATIONS, INC., ARLINGTON, VA.
A model for space radar clutter
[AD-A077299] N80-14302
DECISIONS AND DESIGNS, INC., MCLEAN, VA.
Validation and error in multiplicative utility functions
[AD-A073362] N80-14699
A criterion validation of multiattribute utility analysis and of a group communication strategy
[AD-A073364] N80-14695
Importance weight assessment for additive, riskless preference functions: A review
[AD-A073365] N80-14700
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702
DEFENCE AND CIVIL INST. OF ENVIRONMENTAL MEDICINE, DOWNSVIEW [ONTARIO].
Investigation of noise hazards in the engine test cell, CFB Baden-Soellingen
[AD-A074391] N80-14147
DEFENCE RESEARCH ESTABLISHMENT, OTTAWA. [ONTARIO].
Development of siting GPS/strapdown inertial navigation system
N80-14031
DEPARTMENT OF DEFENCE, CANBERRA [AUSTRALIA].
Aeronautical Research Laboratories
[RM76/30007] N80-15026
DEPARTMENT OF ENERGY, BARTLESVILLE, OKLA.
Ambient temperature, fuel economy, emissions, and trip length
[PB-298047/3] N80-14976
DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Liquified gaseous fuels safety and environmental control assessment program
[DOE/EV-0026] N80-14266
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[TID-28844-DRAFT] N80-14508
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[DOE/TIC-10127] N80-14515
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[TID-28852-DRAFT] N80-14522
Geothermal energy: Program summary
[DOE/ET-0101] N80-14542
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[TID-28844-DRAFT] N80-14543
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[TID-28843-DRAFT] N80-14544
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[TID-28856-DRAFT] N80-14545
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[NASA-CR-135192] N80-14129
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N80-14876
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BONN [WEST GERMANY].
The European approach to the selection and training of SL payload specialists
N80-14681
DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK [WEST GERMANY].
An observer system for sensor failure detection and isolation in digital flight control systems
N80-14023
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[SER-B-234] N80-14480
Calculation of the azimuth of the section between Helsenpiesenberg and Tromsoe from simultaneous direction measurements of a satellite in order to improve on the orientation of the European Triangulation Network [RETrig]
[SER-B-236] N80-14481
Gravimetric vertical deflection determination for the North Sea regions [OVDINS 1]
[SER-B-235] N80-14622
DOW CHEMICAL CO., WALNUT CREEK, CALIF.
Evaluation of alternate vanadium compounds for use in fiberglass reinforced plastic soil surfacing
[AD-A074671] N80-14615
DRAPER [CHARLES STARK] LAB., INC., CAMBRIDGE, MASS.
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[AD-A074741] N80-14906
DREXEL UNIV., PHILADELPHIA, PA.
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[AD-A074951] N80-14391
DREYFUSS-PELLMAN CORP., STAMFORD, CONN.
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[AD-A078806] N80-14111
DUNLAP AND ASSOCIATES, INC., LA JOLLA, CALIF.
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N80-14753
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N80-14714
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[AD-A072723] N80-14796

E

EAGLE-PICHER INDUSTRIES, INC., JOPLIN, MO.
Improved thermal battery performance
[AD-A073856] N80-14506
EDGERTON, GERMESHAUSEN AND GRIER, INC., GOLETA, CALIF.
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[CONF-780605-2] N80-14394
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N80-14028
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N80-14037
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[EPRI-ER-515] N80-14536
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[CONF-780550-9] N80-14563
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N80-14647
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[PB-298077/9] N80-14594
ENVIRONMENTAL MONITORING AND SUPPORT LAB., LAS VEGAS, NEV.
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[PB-297984/7] N80-14470
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
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[PB-299209/7] N80-14597
ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., WESTLAKE VILLAGE, CALIF.
Particulate sampling and analysis
[PB-299637/9] N80-14601
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[AD-A074799] N80-14458
EUROPEAN SPACE AGENCY, PARIS [FRANCE].
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[ESA-TT-523] N80-14143
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[ESA-TT-593] N80-14328
Synchronization of clocks in the 100 ps range
[ESA-TT-578] N80-14381
Satellite Remote Sensing: Applications in Agrometeorology and Agrometeorology
[ESA-SP-1020] N80-14440
The Earthnet programme
N80-14444
The ESA remote sensing program: Present activities and future plans
N80-14449
Biology and medicine in space: Research opportunities offered by Spacelab. An invitation to European investigators
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[ESA-TT-595] N80-14789
Computation of the electrodynamic behavior of complicated structures by means of the integral equation method
[ESA-TT-596] N80-14790
Field computation by the geometrical theory of diffraction
[ESA-TT-594] N80-14819
Solution of electromagnetic boundary value problems of complicated structures. Theory of the integral equation method
[ESA-TT-598] N80-14820
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N80-14448

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[ESA-PSS-05/QRM-10E-ESTEC-ISS-2] N80-14350

F

FAIRCHILD REPUBLIC CO., FARMINGDALE, N. Y.
Surface conforming thermal/pressure seal
[NASA-CASE-MSC-18422-1] N80-14400
FEDERAL ARMED FORCES MEDICAL COLL., MUNICH [WEST GERMANY].
Therapy on nerve agent poisoning
N80-14732
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[AD-A073484] N80-14144
FLORENCE UNIV. [ITALY].
Experimental campaign for the analysis of dynamic clutter: The data acquisition system
N80-14078
Experimental campaign for the analysis of dynamic clutter: Processing of recorded data
N80-14079
Preliminary study on the utilization of adaptive radar receivers with diversity polarization
N80-14081
Interference effects in monopulse estimation in Secondary Surveillance Radar [SSR] systems
N80-14094
Analysis of the correlation algorithms used by the monopulse secondary surveillance radar dwell-time processor
N80-14099
FLORIDA STATE UNIV., GAINESVILLE.
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N80-14629
FLORIDA STATE UNIV., TALLAHASSEE.
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N80-14822
FONDAZIONE UGO BORDONI, ROME [ITALY].
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[FUB-28] N80-14291
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N80-14292
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N80-14441
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N80-14442
Physical background of remote sensing
N80-14443
The agro-ecological zones project
N80-14445
Remote sensing applied to agriculture
N80-14446
FOREST SERVICE, WASHINGTON, D. C.
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N80-14425
FORSCHUNGSINSTITUT FUER FUNK UND MATHEMATIK, WERTHOVEN [WEST GERMANY].
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[REPT-270] N80-14325
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[REPT-274] N80-14459
Investigation of security classifications for secure information flow
[REPT-275] N80-14766
Bootstrapping for a BCPL compiler
[REPT-271] N80-14792
A communication problem in a computer network
[REPT-272] N80-14793
A cost optimal solution for deadlocked processes
[REPT-273] N80-14794
FORSCHUNGSINSTITUT FUER HOCHFREQUENZPHYSIK, WERTHHOVEN [WEST GERMANY].
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N80-14780
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G

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N80-14740
Concepts of fatigue
N80-14741
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[PB-298525/6] N80-14279
Commercializing solar heating: A national strategy needed
[PB-297882/3] N80-14575
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[PB-299224/7] N80-14961
GENERAL ATOMIC CO., SAN DIEGO, CALIF.
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[GA-A-15228] N80-14421
GENERAL DYNAMICS/CONVAIR, SAN DIEGO, CALIF.
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[NASA-CR-159166] N80-14197
GENERAL DYNAMICS/FORT WORTH, TEX.
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N80-14026
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[NASA-CR-135250] N80-14116
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[NASA-CR-135267] N80-14117
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[NASA-CR-135268] N80-14118
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[NASA-CR-159597] N80-14122
The CF6 jet engine performance improvement: New front mount
[NASA-CR-159639] N80-14127
A conceptual design study on the application of liquid metal heat transfer technology to the solar thermal power plant
[NASA-CR-162546] N80-14484
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Thermal protection system repair kit program
[NASA-CR-160418] N80-14181
GENERAL ELECTRIC CO., SUNNYVALE, CALIF.
Liquid weighing by buoyancy technique
[GEFR-SP-158] N80-14836
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[AD-A074225] N80-14218
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[AD-A074220] N80-14222
Meteor wind over Atlanta, 34 deg north, 84 deg west
N80-14628
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[GMD-MITT-47] N80-14781
Comparison of regression, difference and ratio estimates in sample theory
[GMD-MITT-42] N80-14818
GRAZ UNIV. [AUSTRIA].
Unsolved problems of the upper atmosphere
N80-14630

GTE SYLVANIA, INC., NEEDHAM HEIGHTS, MASS.
Sidband coder study
[AD-A074427] N80-14312
Lithium inorganic electrolyte battery development
[AD-A073656] N80-14505
GULF SOUTH RESEARCH INST., NEW ORLEANS, LA.
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[PB-299291/5] N80-14596

H

HAGUE INTERNATIONAL, SOUTH PORTLAND, MAINE.
High pressure ceramic heat exchanger. Phase 1: Deadband experimental verification
[COO-4236-3] N80-14364
HAMILTON STANDARD, FARMINGTON, CONN.
A redundant inertial navigation system for IUS
N80-14029
HARRIS CORP., MELBOURNE, FLA.
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[AD-A073429] N80-14305
Earth terminal subsystem study. Volume 4: Transmitter combining for simultaneous transmission of FDMA and TDMA carriers
[AD-A073356] N80-14306
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[AD-A074047] N80-14323

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[NASA-CR-3134] N80-14760
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[AD-A074953] N80-14221
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[CONF-790802-11] N80-14238
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[CONF-790635-2] N80-14347
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[CONF-790646-5] N80-14361
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[CONF-790655-1] N80-14363
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[AD-A073358] N80-14761
Baseline software data system. Volume 2: Database reference manual
[AD-A073359] N80-14762
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[NASA-CR-3231] N80-14257
ILLINOIS UNIV. AT CHICAGO CIRCLE, CHICAGO.
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[PB-299151/1] N80-14277
ILLINOIS UNIV. AT THE MEDICAL CENTER, CHICAGO.
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[PB-299583/5] N80-14696
ILLINOIS UNIV. AT URBANA-CHAMPAIGN.
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[AD-A073878] N80-14230
A project to investigate mechanisms and methodologies for the design and construction of communicating concurrent processes in real-time environments
[NASA-CR-162557] N80-14791
ILLINOIS UNIV., URBANA.
Biological conversion of biomass to methane
[COO-2917-12] N80-14270
New hybrid 1971 energy intensities, part 1
[COO-4624-4-PT-1] N80-14516
Energy conservation in the US economy from increased recycle of obsolete steel scrap
[COO-2893-10] N80-14524
The HEAO-1 neutron star timing experiment
N80-14989
Research in astronomy
[NASA-CR-162558] N80-15025

INDIANA UNIV., BLOOMINGTON.
Correlated ground based observations in support of the HEAO-1 X-ray observatory
N80-14980

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N80-14427
Quantification of syntactic information content in graphics used for social empirical research
N80-14428
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N80-14429
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N80-14430
An interactive editor for cartographic data
N80-14431
OVPREC: A program automatic recognition of overlapping zones of broadened cartographic line elements
N80-14432
Cartographic automation status in a German hydrographic institute
N80-14433
Establishment of a data base of the administrative boundaries of Germany, scale 1:500,000 to 1:1,000,000
N80-14434
Generalization algorithms
N80-14435
Three types of geographic data structure: Similitudes, differences, and possible synthesis
N80-14436
Geographic information systems: A review, with discussion of future developments
N80-14437
A program for the design of geographical maps
N80-14438
An algorithm for the linearization of raster images for minicomputers
N80-14439
On the use of digital photogrammetric measurements in the compilation of topographic maps [SER-1-ORIGINAL-REPT-76] N80-14462

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N80-14135

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Analytic modeling of aerosol size distributions [NASA-CR-159170] N80-14815

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Development of the steam-iron process for hydrogen production, 9010 [FE-2435-32] N80-14258
High-BTU coal gasification processes [ANL/CES/TE-79-2] N80-14263
Fuel cell option [CONF-780917-1] N80-14523

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IOWA STATE UNIV. OF SCIENCE AND TECHNOLOGY, AMES.
Analysis of the thermodynamics and phase relationships of a portion of the vanadium-oxygen system [IS-M-212] N80-14953
X-ray emission from the region of gamma 195+5 N80-14986

ISTITUTO DI ELETTRONICA E TELECOMUNICAZIONI, PISA [ITALY].
Architecture of the single reply detector-processor of the Secondary Surveillance Radar [SSR] of a Discrete Address Beacon System [DABS]
N80-14095
Performance characteristics of the detector-quantizer subsystem of the Secondary Surveillance Radar [SSR] function of a Discrete Address Beacon System [DABS]
N80-14096
Azimuth discrimination of the Secondary Surveillance Radar [SSR] section of a Discrete Address Beacon System [DABS]
N80-14097

ITALIAN AIR FORCE MEDICAL SERVICE H. Q., ROME.
Some considerations concerning methods to evaluate and assess workload in aircraft pilots
N80-14743

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
The Deep Space Network [NASA-CR-162524] N80-14150
Network functions and facilities
N80-14151
DSN radio science system, Mark III-80
N80-14152
Voyager mission support
N80-14153
Pioneer 11 Saturn encounter mission support
N80-14154
Stability of the multimegabit telemetry carrier loop
N80-14155
An examination of ancillary equipment for a proposed 34.3 GHz high power gyrotron TWT amplifier
N80-14156
Evaluation of the VA-876P klystron for the 20-kW X-band uplink transmitter
N80-14157
A computer-aided design system for custom large-scale integrated circuits
N80-14158
A study of the influence of oil saturation on the 64 meter antenna hydrostatic bearing grout
N80-14159
Voyager 1979: Update to the radial and solar cycle variations in the solar wind phase fluctuation spectral index
N80-14160
An efficient program for decoding the [255,223] Reed-Solomon code over GF [2 to the 8th power] with both errors and erasures, using transform decoding
N80-14161
The microprocessor-based synthesizer controller
N80-14162
Real-time ISEE data system [NASA-CR-162549] N80-14173
Methods for calculation of engineering parameters for gas separation [NASA-CR-162532] N80-14211
Electromagnetic power absorber [NASA-CASE-NPO-13830-1] N80-14281
Multiple anode arc lamp system [NASA-CASE-NPO-10857-1] N80-14330
Method for analyzing radiation sensitivity of integrated circuits [NASA-CASE-NPO-14350-1] N80-14332
Potential heat exchange fluids for use in sulfuric acid vaporizers [NASA-CR-162548] N80-14358
Reactor for simulation and acceleration of solar ultraviolet damage [NASA-CR-162533] N80-14405
Method for forming a solar array strip [NASA-CASE-NPO-13652-3] N80-14474
Residential photovoltaic module and array requirements study, appendices [NASA-CR-162529] N80-14481
Development of mullite substrates and containers [NASA-CR-162543] N80-14485
Investigation of test methods, material properties, and processes for solar cell encapsulants [NASA-CR-162542] N80-14486
Application of field-modulated generator systems to dispersed solar thermal electric generation [NASA-CR-162536] N80-14488
Environmental testing of block 3 solar cell modules. Part 1: Qualification testing of standard production modules [NASA-CR-162547] N80-14489
Fracture strength of silicon solar cells [NASA-CR-162540] N80-14490
solar thermal power systems advanced solar thermal technology project, advanced subsystems development [NASA-CR-162546] N80-14491
Silicon materials outlook study for 1980-1985 calendar years [NASA-CR-162541] N80-14492
Proceedings of the DOE chemical/hydrogen energy contractor review systems [CONF-771131] N80-14572
Ozonation of cooling tower waters [NASA-CASE-NPO-14340-1] N80-14579
System for real-time crustal deformation monitoring [NASA-CASE-NPO-14124-1] N80-14603
A controlled rate freeze/thaw system for cryopreservation of biological materials [NASA-CR-162511] N80-14675
Dialysis system [NASA-CASE-NPO-14101-1] N80-14687
Synthesis and biological screening by novel hybrid fluorocarbon hydrocarbon compounds for use as artificial blood substitutes [NASA-CR-162537] N80-14689
High resolution threshold photoelectron spectroscopy by electron attachment [NASA-CASE-NPO-14078-1] N80-14877
User requirements for a patient scheduling system [NASA-CR-162539] N80-14956

JOHNS HOPKINS UNIV., BALTIMORE, MD.
Robust waveform design [AD-A074932] N80-14311
Measured performance of laser intensity subcarrier direct detection optical communication receivers
N80-14383
Extended analysis of small group performance and the effects of contingency management in a programmed environment [AD-A068665] N80-14705
Optical probing of acoustic emission waves [AD-A074160] N80-14854

JOINT RESEARCH CENTRE OF THE EUROPEAN COMMUNITIES, ISPRA [ITALY].
Agroclimatological methods involving remote sensing techniques
N80-14451

K

KANSAS STATE UNIV., MANHATTAN.
An experimental study of natural convection heat transfer in vertical porous media
N80-14352
Low impedance manganin stress gauge system for severe shock wave environments [UCRL-81605] N80-14379
Modeling of blood flow in vessels of the microcirculation
N80-14685

KANSAS UNIV. CENTER FOR RESEARCH, INC., LAWRENCE.
The quasi-vortex-lattice method for wings with edge vortex separation [NASA-CR-162530] N80-14052

KENTUCKY UNIV., LEXINGTON.
Photovoltaic energy conversion in polymer films
N80-14477

L

LABORATOIRE D'AEROTHERMIQUE DU C.N.R.S., MEUDON [FRANCE].
Study of the formation of laminar flow separation induced by the deflection of a control surface [REPT-79-2] N80-14060
Stability of a flat wall jet [REPT-79-5] N80-14370

LABORATORIUM FUER BETRIEBSFESTIGKEIT, DARMSTADT [WEST GERMANY].
Review of investigations into aeronautics related fatigue Federal Republic of Germany [LBF-S-142] N80-14422

LAND RESOURCE RESEARCH INST., OTTAWA [ONTARIO].
Crop weather models: Concepts and applications
N80-14450

LIFE SYSTEMS, INC., CLEVELAND, OHIO.
Regenerative CO2 removal for PLSS application [NASA-CR-160419] N80-14718

LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Air traffic density and distribution measurements [AD-A073229] N80-14064
Speech enhancement using a soft-decision maximum likelihood noise suppression filter [AD-A074082] N80-14309
Capacity allocation techniques in a multi-user satellite system [AD-A074018] N80-14310
Acoustic discrimination [AD-A073772] N80-14614

LITTLE [ARTHUR D.], INC., CAMBRIDGE, MASS.
Energy analysis of the basic materials utilized in electric power transmission systems [HCP/T5043-01] N80-14510
Research and development of methods for estimating physicochemical properties of organic compounds of environmental concern [AD-A074829] N80-14583

LITTON SYSTEMS [CANADA] LTD., REXDALE, [ONTARIO].
A high accuracy flight profile determining system
N80-14042

LOCKHEED ELECTRONICS CO., HOUSTON, TEX.
Clustering algorithm evaluation and the development of a replacement for procedure 1 [NASA-CR-160424] N80-14772
Introduction to the Apollo collections: Part 2: Lunar breccias [NASA-CR-162559] N80-15013

LOCKHEED-GEORGIA CO., MARIETTA.
An assessment of and approach to the validation of digital flight control systems
[NASA-CR-3157] N80-14036
Aircraft fuel system simulator tests with autoignitive kerosene [jet A fuel with FM-9 additive]
[AD-A071237] N80-14256
LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
GIM6 code user's manual for the STAR-100 computer
[NASA-CR-3157] N80-14354
LOGICON, INC., SAN DIEGO, CALIF.
Vocabulary specification for automatic speech recognition in aircraft cockpits
[AD-A073703] N80-14303
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Real-time ISEE data system
[NASA-CR-162549] N80-14173
Wave propagation in a dc superconducting cable. Part 1: Analysis
[LA-UR-79-226] N80-14346
Applications of fuel cells in transportation
[LA-UR-79-628] N80-14526
Superconducting magnetic energy storage for electric power system dynamic stabilization
[LA-UR-79-1220] N80-14535
Environmental options for coal use
[LA-UR-79-1393] N80-14584
Homomorphic processing of seismic signals
[LA-7876-MS] N80-14620
Contribution Monte Carlo
[LA-7849-MS] N80-14817
Sound velocity and equation-of-state measurements in high pressure fluid and solid helium
[LA-UR-79-721] N80-14856
Missions and planning for nuclear space power
[LA-UR-79-1240] N80-14893
Apollo 12 feldspathic basalts 12031, 12038, and 12072; petrology, comparison
[LA-UR-79-1117] N80-15014
Petrology of the Apollo 12 pigeonite basalt suite
[LA-UR-79-1116] N80-15015

M

MARCONI AVIONICS LTD., ROCHESTER [ENGLAND].
Recent advances in fibre optics for high integrity digital control systems
N80-14025
MARCONI CO. LTD., CHELMSFORD [ENGLAND].
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: MODSIM software description
[ESA-CR(P)-878-VOL-2] N80-14782
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: Curve fitting software description
[ESA-CR(P)-878-VOL-3] N80-14783
Analytic techniques for processing signal and noise through a non-linear channel using MODSIM. Volume 1: Analysis methods and preliminary results
[ESA-CR(P)-1228-VOL-1] N80-14784
Supplement to: Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 2: Moment software description
[ESA-CR(P)-1228-VOL-2] N80-14785
Analytic techniques for processing signal and noise through a nonlinear channel using MODSIM. Volume 3: General theoretical techniques
[ESA-CR(P)-1228-VOL-3] N80-14786
MARK RESOURCES, INC., MARINA DEL REY, CALIF.
TMR processing procedures for GSRS spin and attitude measurements
[AD-A074947] N80-14171
MARLATT AND ASSOCIATES, FORT COLLINS, COLO.
Assessment of the applicability of the national fire weather data library to wind energy analyses
[PNL-2538] N80-14655
MARTIN MARIETTA AEROSPACE, DENVER, COLO.
Propulsion options for the HI SPOT long endurance drone airship
[AD-A074595] N80-14132
MARTIN MARIETTA AEROSPACE, ORLANDO, FLA.
US ROLAND 2 Logistics Model [ROLOG]: User's guide
[AD-A074449] N80-14960
MARTIN MARIETTA CORP., DENVER, COLO.
Thermal protection system flight repair kit
[NASA-CR-160417] N80-14176
MARTIN MARIETTA CORP., VANDENBERG AFB, CALIF.
DOD STS ground support systems
[VCR-76-032-05] N80-14178
MARYLAND UNIV., COLLEGE PARK.
A study of fire safety effectiveness statements
[PB-299169/3] N80-14275
Ability, involvement and climate as multiple and interactive predictors of performance
[AD-A068891] N80-14706
Work performance as a function of the interaction of ability, work values, and the perceived work environment
[AD-A068893] N80-14707
Methodological and conceptual issues in understanding ability-performance relationships
[AD-A068894] N80-14708
Rating errors of inconsistency as a function of dimensionality of behavioral anchors
[AD-A068922] N80-14710
A monolithic surface acoustic wave charge transfer device
N80-14837
Pion nucleon interaction at low energy
[ORO-5126-65] N80-14895
The ionization and neutralization of sputtered atoms
N80-14939
MASON AND HANGER-SILAS MASON CO., INC., AMARILLO, TEX.
Ultraviolet spectroscopic methods for quality control
[MHSMP-79-29] N80-14407
MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Wave power systems
[PB-299851/6] N80-14576
Toward improved techniques for predicting soil strength in offshore environments
[PB-299960/5] N80-14625
A systematic methodology for designing the architecture of complex software systems
[AD-A074911] N80-14778
Grain boundary structure and properties
[COO-5002-3] N80-14947
Diffusion induced grain boundary migration
[COO-5002-2] N80-14948
Diffusional mass transport in polycrystals containing stationary or migrating grain boundaries
[COO-5002-1] N80-14949
The IMS Data Storage Hierarchy: DSH-1
[AD-A073375] N80-14965
The IMS data storage hierarchy: DSH-2
[AD-A073376] N80-14966
A-3 scientific results
N80-14982
High energy X-ray results from HEAO-1: X-ray pulsars, and the all sky survey
N80-14984
High resolution X-ray spectroscopy on the Einstein Observatory
N80-14994
MATERIALS RESEARCH LABS., MELBOURNE [AUSTRALIA].
Corrosion in the Australian defence scene. 1: The Army and ancillary equipment for the RAAF
[MRL-R-752] N80-14233
Microbial colonization of materials at Innisfail, Queensland
[MRL-TN-428] N80-14670
Underwater sound scattering by marine organisms. A review
[MRL-R-756] N80-14841
MAX-PLANCK-INSTITUT FUER AERONOMIE, LINDAU UBER NORTHEIM [WEST GERMANY].
Speeches and lectures delivered on the occasion of Professor Doctor Walter Dieminger's retirement as director of the Max-Planck Institute for Aeronomy
[REPT-55/1977] N80-14609
MAX-PLANCK-INSTITUT FUER PHYSIK UND ASTROPHYSIK, GARCHING [WEST GERMANY].
An attempt to trigger ionospheric bubbles and equatorial spread F with the double barium cloud technique
[MPI-PAE/EXTRATERREST-152] N80-14621
Hard X-ray observation of Cygnus-3
[MPI-PAE/EXTRATERREST-155] N80-15002
MAX-PLANCK-INSTITUT FUER STROEMUNGSFORSCHUNG, GOETTINGEN [WEST GERMANY].
Investigation of coherent structures in the velocity field of a fully developed turbulent channel flow using flow visualization and anemometry
[MPIS-MITT-66] N80-14366
Experiments to show the existence of the liquefaction shock wave in retrograde gases
[MPIS-MITT-67] N80-14367
An investigation of the fluctuations of the wall pressure and the wall pressure gradient beneath a turbulent boundary layer
[MPIS-MITT-68] N80-14368
Wall pressure fluctuations generated by a pair of vortices
[MPIS-6/1979] N80-14369
MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON BEACH, CALIF.
Shuttle orbiter TPS flight repair kit development
[NASA-CR-160416] N80-14179
An analysis of external burning propulsion
[AD-A074639] N80-14192
MCMASTER UNIV., HAMILTON [ONTARIO].
Microcomputer-based on-line state estimation with applications to satellites
N80-14033
MEDICAL DE L'AERONAUTIQUE CIVILE, PARIS [FRANCE].
Supersonic aerial transport: Medical and physiological aspects
N80-14683
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., MUNICH [WEST GERMANY].
Failure detection, isolation and indication in highly integrated digital guidance and control system
N80-14027
Investigation of the oscillatory and flight behavior of rotor systems in relation with atmospheric turbulence
[BMVG-FBWT-79-5] N80-14142
MESSERSCHMITT-BOELKOW-BLOHM G.M.B.H., OTTOBRUNN [WEST GERMANY].
High angle of attack characteristics of different fighter configurations
[MBB-UFE-1443(O)] N80-14058
Excitation and analysis technique for flight flutter tests
[MBB-UF-1446(O)] N80-14140
Stability and control aspects of the CCV-F104G
[MBB-UFE-1447(O)] N80-14141
METAL PROPERTIES COUNCIL, INC., NEW YORK.
Development of a standard methodology for the correlation and extrapolation of elevated temperature. Volume 1: A summary of a state-of-the art review and a workshop
[EPRI-FP-1062-VOL-1] N80-14835
METEOROLOGY INTERNATIONAL, INC., MONTEREY, CALIF.
Methods and programs to utilize satellite indirect soundings in environmental analysis and prediction
[AD-A074772] N80-14654
MIAMI UNIV., CORAL GABLES, FLA.
Fifth Ocean Thermal Energy Conversion Conference, volume 2, sections 4-5
[CONF-780236-P2] N80-14553
Fifth Ocean Thermal Energy Conversion Conference, volume 3, sections 6-7
[CONF-780236-P3] N80-14554
Fifth Ocean Thermal Energy Conversion Conference, volume 1, sections 1-3
[CONF-780236-P1] N80-14555
MICHIGAN UNIV., ANN ARBOR.
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Self-study guide
[PB-299256/8] N80-14723
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/6] N80-14724
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 1
[PB-299305/3] N80-14725
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 2
[PB-299306/1] N80-14726
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 3
[PB-299307/9] N80-14727
Electrical compensation in InP produced by background impurities and structural defects
[AD-A074178] N80-14945
MIDDLEBURY COLL., VT.
X-ray iron-line emission from the SN 185 remnant
N80-14990
MIDWEST RESEARCH INST., GOLDEN, COLO.
Rough cost estimates of solar thermal/coal or biomass-derived fuels
[SERI/TP-35-279] N80-14269
Application of diffusion research to solar energy policy issues
[SERI/TR-51-194] N80-14518
Implementation of state solar incentives: Land-use planning to ensure solar access
[SERI/TR-51-163] N80-14519
Implementation of state solar incentives: A preliminary assessment
[SERI/TR-51-159] N80-14520
Thermal energy storage for solar applications: An overview
[SERI/TP-34-089] N80-14546
A review of the economics of selected passive and hybrid systems
[SERI/TP-61-144] N80-14547
Commercializing solar architecture
[SERI/TP-62-113] N80-14548
Insolation model', data and algorithms
[SERI/TR-36-110] N80-14617
MILCO INTERNATIONAL, INC., HUNTINGTON BEACH, CALIF.
State of the art for digital avionics and controls, 1978
N80-14018
MINNESOTA UNIV., MINNEAPOLIS.
Viscous film flows with contact lines: Finite element simulation, a basis for stability assessment and design optimization
N80-14351
Studies with a small seismic array in easicentral Minnesota
N80-14604
Categorical data models for complex sampling schemes
N80-14827
Heat capacity of amorphous and disordered Nb3Ge thin films
N80-14931

MISSISSIPPI STATE UNIV., STATE COLLEGE.
Identification of limit cycles in multinonlinearity, multiple path systems
N80-14333
Visualization of natural convection in flat plate solar collectors
N80-14476

MOTOR VEHICLE MANUFACTURERS ASSOCIATION OF THE UNITED STATES, DETROIT, MICH.
Motor Vehicle Manufacturers Association [MVMA] Two-Dimensional Crash Victim Simulation tutorial system: Audio-visual program
[PB-299257/6]
N80-14724
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 1
[PB-299305/5]
N80-14725
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 2
[PB-299306/3]
N80-14726
MVMA Two-Dimensional Crash Victim Simulation, version 4, volume 3
[PB-299307/9]
N80-14727

MOTOROLA, INC., PHOENIX, ARIZ.
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14470-1]
N80-14229

MOUND LAB., MIAMISBURG, OHIO.
Studies of directly absorbing fluids for mid-temperature solar thermal applications
[MLM-2625-OP]
N80-14540
Construction and initial operation of the Miamisburg salt-gradient solar pond
[MLM-2626-OP]
N80-14541
Evaluation of fuel resources and requirements for the magnetic fusion energy program
[MLM-2619]
N80-14570

N

NAGOYA UNIV., JAPAN.
Inverse method for the mixed nonlinear Schroedinger Equation and soliton solutions
[IPPJ-417]
N80-14910
Ion heating by the current-driven turbulence in an inhomogeneous plasma
[IPPJ-421]
N80-14911
Post collision interaction in photoexcited argon LMM Auger processes
[IPPJ-422]
N80-14912
Enhancement of D-T reaction rate due to D-T contact
[IPPJ-419]
N80-14913
Stability of high density plasma in a multiple mirror
[IPPJ-418]
N80-14914
Investigation of molybdenum impurity diffusion during hydrogen gas puffing in JIPP T-II plasma
[IPPJ-412]
N80-14915
Nonlinear shift of resonance velocity in interaction between particles and plasma cyclotron waves
[IPPJ-423]
N80-14916
Nonadiabatic energy transfer between coupled L-C resonators and its possible applications to high-power RF pulse generation
[IPPJ-32]
N80-14917
Super-banana limiter as a possible edge cooling scheme
[IPPJ-425]
N80-14918
Behaviour of laser-produced plasma in a uniform magnetic field: Plasma instabilities
[IPPJ-424]
N80-14919
Electron spectra resulting from autoionization in low-energy Li[+] + He collisions
[IPPJ-420]
N80-14920

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
Anniversary of Apollo 11 moon landing press conference
[NASA-TM-80844]
N80-14148
Tenth anniversary of Apollo 11 moon landing
[NASA-TM-80473]
N80-14149
Press conference on Skylab
[NASA-TM-80752]
N80-14167
Press briefing: MAGSAT
[NASA-TM-80757]
N80-14168
Press briefing on Dr. Frosch's meeting with President Carter regarding the space shuttle
[NASA-TM-80753]
N80-14174
Procedure for the formation of a coating on an object by polymerization by luminescent discharge
[NASA-TM-75926]
N80-14248
Piping and tubing technology: A compilation
[NASA-SP-5901(01)]
N80-14402
Power factor controller
[NASA-TM-80755]
N80-14479
Microanatomy of neurohypophysis of rats under experimental conditions
[NASA-TM-75947]
N80-14671
RNA content in motor and sensory neurons and surrounding neuroglia of mouse spinal cord under conditions of hypodynamia and following normalization
[NASA-TM-75983]
N80-14672
The effects of hypodynamia and hypokinesia on the arterial bed of pelvic limb muscles in the rabbit
[NASA-TM-75984]
N80-14673
Effect of rhythmic photostimulation on monkeys with hypothesis of post-encephalitic genesis
[NASA-TM-75990]
N80-14674
Effect of prolonged hypokinesia on tissue blood flow
[NASA-TM-76005]
N80-14688
Technologies for the handicapped and the aged
[NASA-TM-80842]
N80-14715
Simulation of physiological systems in order to evaluate and predict the human condition in a space flight
[NASA-TM-76016]
N80-14716
Biological systems for human life support: Review of the research in the USSR
[NASA-TM-76018]
N80-14717
Press conference: FY 1980 budget
[PP79-10182]
N80-14968
The NASA FY 1980 budget
[PP79-10183]
N80-14969
A review of NASA international programs
[NASA-TM-80845]
N80-14971
News conference on Voyager-2-Jupiter encounter
[NASA-TM-80854]
N80-15008
Pioneer Saturn encounter news briefing
[NASA-TM-80855]
N80-15009
Future of planetary exploration
[NASA-TM-80852]
N80-15010
Possible radio emission mechanism for pulsars
[NASA-TM-75715]
N80-15023

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.
Effect of tip planform on blade loading characteristics for a two-bladed rotor in hover
[NASA-TM-78615]
N80-14049
Acoustically swept rotor
[NASA-CASE-ARC-11106-1]
N80-14107
Quiet short-haul research aircraft familiarization document
[NASA-TM-81149]
N80-14108
Pilot control through the TAFCOS automatic flight control system
[NASA-TM-81152]
N80-14138
An extended soft-cube model for the thermal accommodation of gas atoms on solid surfaces
[NASA-TM-81163]
N80-14941

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, HUGH L. DRYDEN FLIGHT RESEARCH CENTER, EDWARDS, CALIF.
Simulation use in the development and validation of HIMAT flight software
N80-14039

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Antenna deployment mechanism for use with a spacecraft
[NASA-CASE-GSC-12231-1]
N80-14183
Laser apparatus
[NASA-CASE-GSC-12237-1]
N80-14384
Coupling device for moving vehicles
[NASA-CASE-GSC-12322-1]
N80-14398
Rocket cosmic sounding network data
[NASA-TM-73283]
N80-14608
Planetary ionosph.tres
N80-14612
The stratosphere: Present and future
[NASA-RP-1049]
N80-14641
Laboratory measurements
N80-14642
Models
N80-14643
Budgets
N80-14644
Radicals, reservoirs, and ions
N80-14645
Meteorology of the stratosphere
N80-14646
Long period changes in stratospheric parameters
N80-14647
Model predictions
N80-14648
HEAO A-2 extragalactic results
N80-14981
Nondispersive spectroscopy of celestial X-ray sources
N80-14993

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Flight Design System-1 System Design Document. Volume 9: Executive logic flow, program design language
[NASA-TM-80841]
N80-14180
Low temperature latching solenoid
[NASA-CASE-MSC-18108-1]
N80-14338
Surface conforming thermal/pressure seal
[NASA-CASE-MSC-18422-1]
N80-14400
Physiological factors in space operations. Emphasis on space shuttle
N80-14682
Preliminary results of penetrator field test program, Tonopah, Nevada, 16-20 April 1979
[NASA-TM-58222]
N80-15012
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162559]
N80-15013

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, JOHN F. KENNEDY SPACE CENTER, COCOA BEACH, FLA.
Space transportation system shuttle turnabout analysis report
[NASA-TM-82845]
N80-14177

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LANGLEY RESEARCH CENTER, HAMPTON, VA.
Sonic-boom wave-front shapes and curvatures associated with maneuvering flight
[NASA-TP-1611]
N80-14045
Aerodynamic characteristics at low Reynolds numbers of several heat-exchanger configurations for wind-tunnel use
[NASA-TM-80188]
N80-14046
A computerized method for calculating flutter characteristics of a system characterized by two degrees of freedom
[NASA-TM-80153]
N80-14055
Wind-tunnel investigation of the flow correction for a model-mounted angle of attack sensor at angles of attack from -10 deg to 110 deg
[NASA-TM-80189]
N80-14110
Preliminary test results of a flight management algorithm for fuel conservative descents in a time based metered traffic environment
[NASA-TM-80194]
N80-14114
Simulator study of stall/post-stall characteristics of a fighter airplane with relaxed longitudinal static stability
[NASA-TP-1538]
N80-14136
Altitude response of several airplanes during landing approach
[NASA-TM-80186]
N80-14139
Determination of ASPS performance for large payloads in the shuttle orbiter disturbance environment
[NASA-TM-80136]
N80-14163
Resonant frequency of microstrip antennas calculated from TE-excitation of an infinite strip embedded in a grounded dielectric slab
[NASA-TM-80190]
N80-14289
Displacement probes with self-contained exciting medium
[NASA-CASE-LAR-11690-1]
N80-14371
Effect of spanwise gust variations
N80-14639
Investigation of effects of temperature, salinity, and electrode design on the performance of an electrochemical coliform detector
[NASA-TM-80130]
N80-14676
Preliminary investigation of pilot scanning techniques of dial pointing instruments
[NASA-TM-80079]
N80-14697
Computational methods for analyzing the transmission characteristics of a beta particle magnetic analysis system
[NASA-TM-80179]
N80-14771
Evaluation of helicopter noise due to b blade-vortex interaction for five tip configurations
[NASA-TP-1608]
N80-14840
Directivity of acoustic radiation from sources
N80-14863
Experimental measurements of moving noise sources
N80-14868
Applications of diffraction theory to aeroacoustics
N80-14870
Experimental and numerical results of sound scattering by a body
N80-14873

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Laser anemometer measurements in a transonic axial flow compressor rotor
[NASA-TM-79323]
N80-14050
Modification of axial compressor streamline program for analysis of engine test data
[NASA-TM-79312]
N80-14051
Digital system for dynamic turbine engine blade displacement measurements
[NASA-TM-81382]
N80-14113
Static test-stand performance of the YF-102 turbofan engine with several exhaust configurations for the Quiet Short-Haul Research Aircraft [QSRA]
[NASA-TP-1556]
N80-14121
Dynamic response of a Mach 2.5 axisymmetric inlet and turbojet engine with a poppet-valve controlled inlet stability bypass system when subjected to internal and external airflow transients
[NASA-TP-1531]
N80-14123
Turbojet-exhaust-nozzle secondary-airflow pumping as an exit control of an inlet-stability bypass system for a Mach 2.5 axisymmetric mixed-compression inlet
[NASA-TP-1532]
N80-14124
Effect of degree of fuel vaporization upon emissions for a premixed partially vaporized combustion system
[NASA-TP-1582]
N80-14125
NASA broad-specification fuels combustion technology program: Status and description
[NASA-TM-79315]
N80-14126
Laser-optical blade tip clearance measurement system
[NASA-TM-81376]
N80-14128
Supercharged topping rocket propellant feed system
[NASA-CASE-XLE-02062-1]
N80-14188

Burning characteristics and fiber retention of graphite/resin matrix composites
[NASA-TM-79314] N80-14196
Improved refractory coatings and method of producing the same
[NASA-CASE-LE ,3169-1] N80-14232
Corrosion resistance of sodium sulfate coated cobalt-chromium-aluminum alloys at 900 C, 1000 C, and 1100 C
[NASA-TM-79311] N80-14234
Friction and wear of plasma-sprayed coatings containing cobalt alloys from 25 deg to 650 deg in air
[NASA-TM-79316] N80-14249
Temperature and pressure measurement techniques for an advanced turbine test facility
[NASA-TM-79278] N80-14374
Efficient laser anemometer for intra-rotor flow mapping in turbomachinery
[NASA-TM-79320] N80-14375
Self-acting lift-pad geometry for circumferential seals: A noncontacting concept
[NASA-TP-1583] N80-14403
Self-reconfiguring solar cell system
[NASA-CASE-LEW-12586-1] N80-14472
Status of the DOE/NASA critical gas turbine research and technology project
[NASA-TM-79307] N80-14493
Sulfate and nitrate collected by filter sampling near the tropopause
[NASA-TP-1567] N80-14581
Intra-ocular pressure normalization technique and equipment
[NASA-CASE-LEW-12955-1] N80-14684
Acoustic considerations of flight effects on jet noise suppressor nozzles
[NASA-TM-81377] N80-14843
Effect of velocity overshoot on the performance of magnetohydrodynamic subsonic diffusers
[NASA-TM-79305] N80-14922

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
Torque equilibrium attitude control for Skylab reentry
[NASA-TM-78252] N80-14169
Electrophoretic fractional elution apparatus employing a rotational seal fraction collector
[NASA-CASE-MFS-23284-1] N80-14397
Coal-shale interface detection system
[NASA-CASE-MFS-23720-2] N80-14423
Solar concentrator
[NASA-CASE-MFS-23727-1] N80-14473
Development and testing of the Junkreper Control Corporation integrated programmable electronic controller and hydronics package
[NASA-TM-78244] N80-14493
Development and testing of the Rho Sigma Incorporated microprocessor control subsystem
[NASA-TM-78246] N80-14496
Development and testing of the Solar Control Corporation modular controller and Solarsat subsystem
[NASA-TM-78243] N80-14498
Development, testing and certification of the sigma research, mant-therm-S-101 thermosyphon heat exchanger
[NASA-TM-78245] N80-14499
Computer program for assessing the economic feasibility of solar energy for single family residences and light commercial applications
[NASA-TM-78251] N80-14501
HEAO Science Symposium
[NASA-CP-2113] N80-14977
Monitor proportional counter N80-14995

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. PASADENA OFFICE, CALIF.
Method of purifying metallurgical grade silicon employing reduced pressure atmospheric control
[NASA-CASE-NPO-14474-1] N80-14229
Electromagnetic power absorber
[NASA-CASE-NPO-13830-1] N80-14281
Multiple anode arc lamp system
[NASA-CASE-NPO-10857-1] N80-14330
Method for analyzing radiation sensitivity of integrated circuits
[NASA-CASE-NPO-14350-1] N80-14332
Apparatus for electrolytically tapered or contoured cavities
[NASA-CASE-XNP-08835-1] N80-14395
Method for forming a solar array strip
[NASA-CASE-NPO-13652-3] N80-14474
Ozonation of cooling tower waters
[NASA-CASE-NPO-14340-1] N80-14579
System for real-time crustal deformation monitoring
[NASA-CASE-NPO-14124-1] N80-14603
Dialysis system
[NASA-CASE-NPO-14101-1] N80-14687
High resolution threshold photoelectron spectroscopy by electron attachment
[NASA-CASE-NPO-14078-1] N80-14877

NATIONAL AEROSPACE LAB., AMSTERDAM (NETHERLANDS).
Flight simulation fatigue tests on lugs with holes expanded according to the split-sleeve cold work method
[NLR-TR-78131-U] N80-14413

NATIONAL AVIATION FACILITIES EXPERIMENTAL CENTER, ATLANTIC CITY, N. J.
An exploratory study of psychophysiological measurements as indicators of air traffic control sector workload N80-14753
Individual and system performance indices for the air traffic control system N80-14756

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.
Materials studies for magnetic fusion energy applications at low temperatures-II
[PB-299281/1] N80-14344
Thermodynamic properties of nitrogen gas derived from measurements of sound speed
[NASA-RP-1051] N80-14257
NBS interagency transducer project 1951 - 1979: An overview
[NBS-TN-1110] N80-14373
Recent improvements to the ASTM-type ultrasonic reference block system
[AD-A074724] N80-14852

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Spectral estimation from irregular arrays
[PB-299363/2] N80-14831

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[PB-300877/4] N80-15019
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[PB-300837/2] N80-15022

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Performance evaluation of the Horiba Instruments, Incorporated model U-7 water quality checker
[PB-298815/2] N80-14382
Proceedings of Second International Symposium on Problems Related to the Redefinition of North American Geodetic Networks
[PB-299260/0] N80-14623
The cost effectiveness of airborne laser hydrography
[PB-299057/0] N80-14668

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United States earthquakes, 1977
[PB-300863/8] N80-14624

NATIONAL RESEARCH INST. FOR MATHEMATICAL SCIENCES, PRETORIA (SOUTH AFRICA).
Optimal rotating column
[CSIR-TWISK-76] N80-14401
Unified formalism of strain and stress
[CSIR-TWISK-77] N80-14414
SCANLINE: A computer program for converting raster maps into line maps
[CSIR-TWISK-43] N80-14426
Automated numerical integration over a triangle
[CSIR-TWISK-78] N80-14805
Finding the root of a monotonic function
[CSIR-TWISK-75] N80-14806
A model for the computational determination of parameter values of anthropomorphic segments
[CSIR-TWISK-79] N80-14807
A new test for multivariate normality and homoscedasticity
[CSIR-TWISK-45] N80-14808
Limits and adjoint situations in mathematical structures
[CSIR-TWISK-67] N80-14809
Indicating cones and the intersection principle for tangential approximants in abstract multiplier rules
[CSIR-TWISK-68] N80-14810
Global saddle-point theorems involving conjugate-like operators, for general and quasi-concave programs
[CSIR-TWISK-72] N80-14811
Optimal steering of a random motion of a point mass
[CSIR-TWISK-71] N80-14812
Computation of moments of functionals of a solution to a stochastic differential equation
[CSIR-TWISK-73] N80-14813
Optimal controls that maximize the probability of hitting a set of targets: A numerical study
[CSIR-TWISK-81] N80-14828
Optimal selection from a random sequence with observation errors
[CSIR-TWISK-69] N80-14829
Two-target pursuit-evasion differential games in the plane
[CSIR-TWISK-74] N80-14830
Results and conjectures on covering metric spaces
[CSIR-TWISK-70] N80-14833

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D. C.
Laser apparatus
[NASA-CASE-GSC-12237-1] N80-14384

NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA.
Atmospheric echo sounding. A bibliography with abstracts
[NTIS/PS-0989/8] N80-14626

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Accident investigation N80-14636

NATURAL DYNAMICS, DES MOINES, IOWA.
Fast production of methane by anaerobic digestion, volume I
[COO-2900-17-VOL-1] N80-14268

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
FEI camera system, acceptance test and checkout procedure, as installed in BQM-34 A/S and BQM-34 E/T
[AD-A074388] N80-14378
Off-center, low velocity, transverse normal impact of a simply supported plate
[AD-A074946] N80-14416

NAVAL ENVIRONMENTAL PREDICTION RESEARCH FACILITY, MONTEREY, CALIF.
Airborne Expendable Bathythermograph [AXBT] observations immediately before and after passage of typhoon PHYLLIS in August of 1975
[AD-A074809] N80-14666

NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY, BAY ST. LOUIS, MO.
Operating scenario for a Hydrographic Airborne Laser Sounder [HALS]
[AD-A073672] N80-14390

NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CALIF.
Image transmission via spread spectrum techniques
[AD-A074606] N80-14308

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
An adaptation and validation of a primitive variable mathematical model for predicting the flows in turbojet test cells and solid fuel ramjets
[AD-A074187] N80-14133
Techniques and benefits of shaping the pulses of binary sequences with application to spread spectrum radio communications
[AD-A073964] N80-14322
Vibration analysis and nondestructive testing using double-exposure holographic techniques
[AD-A073457] N80-14415
Power spectra of geomagnetic fluctuations between 0.4 and 40 Hz
[AD-A074378] N80-14616
A study of the relationship between oceanic chemical mesoscale and sea surface thermal structure as detected by satellite infrared imagery
[AD-A074186] N80-14663
A consideration of factors contributing to strength differences in men and women
[AD-A072671] N80-14894
Analog and digital hardware development for a microcomputer controlled data acquisition system for acoustical imaging
[AD-A074446] N80-14763

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Microbial deterioration of hydrocarbon fuels from oil shale, coal, and petroleum. 1: Exploratory experiments
[AD-A073761] N80-14259
Maximum entropy wavenumber analysis
[AD-A073290] N80-14304
Ocean wave spectrometer measurements in the gulf stream experiment
[AD-A074369] N80-14665
Equilibrium and propagation of a rotating relativistic electron beam in the absence of an external guide field
[AD-A074803] N80-14834
RAYSTC: A computer code for calculating single ray-path statistics, assuming the Garrett-Munk model of internal waves
[AD-A073762] N80-14844
The fundamentals of thermal imaging systems
[AD-A073763] N80-14902
Passing infrared surveillance - new methods of analysis
[AD-A074742] N80-14904
X-ray variability observed with HEAO A-1 N80-14978
Progress of the HEAO A-1 catalog N80-14979

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Rigid-rotor equilibrium of intense relativistic electron beam
[AD-A073318] N80-14892

NAVAL WEAPONS CENTER, CHINA LAKE, CALIF.
Preliminary study of some graphite electrode surfaces responsive to iron and heavy metals by single-sweep voltammetry
[AD-A074605] N80-14343

NEVADA UNIV., LAS VEGAS.
Two dimensional aeroelastic interference effects on oscillating airfoils with flaps in ventilated subsonic wind tunnels
[NASA-CR-3210] N80-14047
NEW MEXICO ENERGY AND MINERALS DEPT., SANTA FE.
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[PB-299489/5] N80-14471
NEW MEXICO INST. OF MINING AND TECHNOLOGY, SOCORRO.
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[PB-299489/5] N80-14471
NEW MEXICO STATE UNIV., LAS CRUCES.
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[PB-299489/5] N80-14471
NEW YORK STATE DEPT. OF TRANSPORTATION, ALBANY.
Construction of an ice-retardant overlay
[PB-298876/4] N80-14274
NEW YORK UNIV., N. Y.
Theoretical studies relating to the interaction of radiation with matter: Atomic collision processes occurring in the presence of radiation fields
[AD-A074185] N80-14881
NORTHROP SERVICES, INC., HOUSTON, TEX.
Introduction to the Apollo collections: Part 2: Lunar breccias
[NASA-CR-162539] N80-15013
NORTHWESTERN UNIV., EVANSTON, ILL.
Hydrogenation catalysts derived from Mo[CO]6/alumina
N80-14208
A minicomputer system for chemical experimentation, with applications to electrochemiluminescence and cyclic differential pulse voltammetry
N80-14210
The influence of microstructure on the metal cutting behavior of AISI 1215 resulfurized free machining steels
N80-14231
Conductive polymers consisting of partially oxidized, face-to-face linked metallomacrocycles
[AD-A074538] N80-14251
Isometrically deformable synchastic surfaces as flexible waveguides
N80-14335
An X-ray study of the region around static and fatigue cracks
N80-14411
Analysis of logical ripple effect of program modification
N80-14769
Simulation and real-time system design: An integrated approach
N80-14795
Diffuse X-ray emission from Abell clusters
N80-14987
NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT, KJELLER.
The effect of locally applied organophosphates on miosis and acetylcholinesterase adaptation to chronic treatment
N80-14731

O

OAK RIDGE GASEOUS DIFFUSION PLANT, TENN.
Hydraulic jumps in a partially filled rotating cylinder
[K/TS-2936] N80-14362
OAK RIDGE NATIONAL LAB., TENN.
Effect of oxidizing environment on mechanical properties of molybdenum and TZM
[ORNL-5431] N80-14342
Ultrasonic flaw detection and characterization in structural materials by spectral analysis
[ORNL/TM-6456] N80-14408
Outlook for nuclear fusion energy
[CONF-7811126-1] N80-14509
Very small aspect ratio tokamaks
[CONF-780811-32] N80-14924
OAK RIDGE Y-12 PLANT, TENN.
Infrared interferometric thickness measurement of polymeric thin films and coatings
[Y-2176] N80-14254
OBSERVATOIRE DE PARIS-MEUDON [FRANCE].
The high spatial resolution of interferometry in the near infrared
N80-15005
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, LECLERC [FRANCE].
Performance tests of linear arrays of needle points as part of a study on field effect cesium engines
[ONERA-RTS-1/3127-EY] N80-14195
The improvement of refractory alloys through powder metallurgy involving sintering with spinning
[ONERA-RT-12/1931-MY] N80-14243
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS [FRANCE].
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341
A general survey of studies on acoustic wave propagation
N80-14859
Propagation in ducts
N80-14864
Propagation in acoustically absorbent materials
N80-14865
OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, TOULOUSE [FRANCE].
Automatic recovery after sensor failure onboard
N80-14024
OFFICE OF NAVAL RESEARCH, ARLINGTON, VA.
Brain waves and the enhancement of pilot performance
N80-14751
OHIO STATE UNIV., COLUMBUS.
High frequency scattering from a thin lossless dielectric slab
[NASA-CR-162564] N80-14290
Communication application of adaptive arrays
[AD-A074558] N80-14307
Ohio exposition center solar home project
[PB-298541/4] N80-14577
Measurement of resistive torques in major human joints
[AD-A071170] N80-14695
OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS.
Process model of how the human operator tracks discontinuous inputs
[AD-A069001] N80-14712
OKLAHOMA STATE UNIV., STILLWATER.
Coefficient quantization effects on pole locations for state-model digital filters
N80-14337
Biaxial bending analysis of hydraulic cylinders
N80-14409
A study of surface zone deterioration of nickel leading to fatigue crack initiation in low cycle fatigue
N80-14412
A probabilistic study of wind-electric conversion systems from the point of view of reliability and capacity credit
N80-14475
A general solution to making inferences about the parameters of mixed linear models
N80-14826
Laser time-resolved site selections spectroscopy of Nd3+ ions in mixed garnet crystals
N80-14938
OKLAHOMA UNIV., NORMAN.
Energy from the West: Energy resource development systems report. Volume 1: Introduction and general social controls
[PB-299177/6] N80-14463
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[PB-299181/8] N80-14467
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[PB-299182/6] N80-14468
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Theoretical study of aerodynamic characteristics of wings having vortex flow
[NASA-CR-159184] N80-14053
Optimized aerodynamic design process for subsonic transport wing fitted with winglets
[NASA-CR-159180] N80-14054
Integrating matrices for arbitrarily spaced grid points
[NASA-CR-159172] N80-14816
OPTICAL COATING LAB., INC., CITY OF INDUSTRY, CALIF.
Assessment of present state-of-the-art sawing technology of large diameter ingots for solar sheet material
[NASA-CR-162535] N80-14273
OPTICAL SCIENCES CO., PLACENTIA, CALIF.
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[AD-A073640] N80-14901
ORANGE FREE STATE UNIV., BLOEMFONTEIN [SOUTH AFRICA].
The asymptotic expansion of the Stein estimator for the matrix case with covariance matrix sigma hyperon unknown
[TR-41] N80-14804
OREGON STATE UNIV., CORVALLIS.
Simulation of communications protocols for a tactical radar network. Part 1: Executive summary
[AD-A074157] N80-14318
A statistical analysis of extreme chinooks in Montana as they relate to large scale circulation changes
N80-14630
OULU UNIV. [FINLAND].
Polar ionosphere
N80-14611

P

PALERMO UNIV. [ITALY].
The influence of transmitter stability on primary radar performance
N80-14084
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Digital wavefront reconstruction for acoustical applications
[AD-A073775] N80-14845
Radiated noise due to boundary-layer transition
[AD-A073491] N80-14846
Transient response optimization of piezoelectric disc transducers by time domain techniques
[AD-A073818] N80-14847
PENNSYLVANIA UNIV., PHILADELPHIA.
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[AD-A074485] N80-14418
PISA UNIV. [ITALY].
The range reduction of primary radar due to rain
N80-14082
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[NASA-CR-162526] N80-15003
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[AAAF-NT-79-12] N80-14059
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N80-14293
POLITECNICO DI TORINO [ITALY].
Onboard collision avoidance system: Environmental influence on the tracking algorithm requirements
N80-14105
POLYTECHNIC INST. OF NEW YORK.
Syntheses and characterization of new fluorinated ketone containing polymers-substituted polystyrenes and the study of their reactions with alcohols
N80-14246
Suppression of interchannel interference in FM receivers
[AD-A074485] N80-14324
Experimental determination of the phases of X-ray reflections
N80-14935
PORT COLUMBUS INTERNATIONAL AIRPORT, OHIO.
Effect of weather conditions on airport operations
N80-14638
POWER ELECTRONICS ASSOCIATES, INC., LINCOLN, MASS.
Bi-directional four quadrant [BDQ4] power converter development
[NASA-CR-159660] N80-14480
PRC ENERGY ANALYSIS CO., MCLEAN, VA.
Satellite Power System [SPS]: An overview of prospective organizational structures in the solar satellite field
[TID-29094] N80-14478
Engineering concerns in solar system design and operation
[SOLAR/0811-79/01] N80-14539
System tests and applications photovoltaic program
[HCP/T4024-01/15] N80-14566
PRINCETON UNIV., N. J.
Fundamental and semi-global kinetic mechanisms of hydrocarbon combustion
[COO-4272-3] N80-14587
Plasma physics of trapping of cosmic rays around supernova
[PPPL-1558] N80-15024
PURDUE UNIV., LAFAYETTE, IND.
Computer controlled internal reflection spectroelectrochemical measurements of fast electron transfer reactions
N80-14205
Zinc oxide on silicon surface acoustic wave convolvers and memory correlators
N80-14284
Acoustic emission: An application to fracture mechanics
N80-14410
Analysis and simulation of wind energy systems
[NASA-CR-162538] N80-14487
On Bayes and gamma-minimax subset selection rules
N80-14823
Microwave magnetoplasma effects in semiconductor powers and arrays of spheres
N80-14933

R

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Energy from the West: Energy resource development systems report. Volume 1: Introduction and general social controls
[PB-299177/6] N80-14463
Energy from the West: Energy resource development systems report. Volume 2: Coal
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[PB-299640/6] N80-14599
Aerometric data analysis for the Houston Area Oxidant Study. Volume 1: Executive summary
[PB-299641/4] N80-14600
Particulate sampling and analysis
[PB-299637/0] N80-14601

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A network graphical conferencing system
[AD-A074610] N80-14779

RASOR ASSOCIATES, INC., SUNNYVALE, CALIF.
A cesium TELEC experiment at Lewis Research Center
[NASA-CR-159729] N80-14386

RAYTHEON CO., BEDFORD, MASS.
Federated microcomputer systems for on-board missile guidance and control
N80-14040

RAYTHEON CO., WALTHAM, MASS.
Dual beam dual mode TWT
[AD-A074719] N80-14344

RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Barriers to the application of wind energy conversion systems in urban settings
N80-14494

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The air quality data handling system user's guide
[PB-299996/9] N80-14592

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[AD-A074567] N80-14220

RICE UNIV., HOUSTON, TEX.
The use of resonance epithermal neutron scattering for the study of condensed matter
N80-14936

ROCHESTER UNIV., N. Y.
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[AD-A072726] N80-14713

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[AD-A074653] N80-14903

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N80-14680
Speech patterns and aircrew workload
N80-14754

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N80-14750

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH [ENGLAND].
Trends in digital data processing and system architecture
N80-14020
Influence of the environmental conditions on a quartz resonator
[RAE-LIB-TRANS-1897] N80-14341
The calculation of inviscid separated flow about a slender cone for large angles of attack
[RAE-TR-2009] N80-14360
Function and computation of transducers for the contact-free measurement of distance on the basis of the eddy current effect, part 1
[RAE-TR-2021] N80-14376

S

SAINT CLOUD STATE COLL., MINN.
Meteorological input to general aviation pilot training
N80-14634

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[NASA-CR-162555] N80-15011

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SANDIA LABS., ALBUQUERQUE, N. MEX.
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[SAND-78-2123C] N80-14420
Li/FeS2 system for thermal batteries
[SAND-79-0470] N80-14513
Thermal aging characteristics of electrodeposited black chrome solar coatings
[SAND-78-2094C] N80-14527
Darrieus wind turbine program at Sandia Laboratories
[SAND-79-0997C] N80-14538
HELIOS and microconcentrators
[SAND-78-1600C] N80-14557
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[DOE/EV-0026] N80-14565

SANDIA LABS., LIVERMORE, CALIF.
Palladium sintering: Shrinkage kinetics for a sponge powder
[SAND-78-8207] N80-14241
Dissociation pressure measurements on salts proposed for thermochemical energy storage
[SAND-79-8033] N80-14532
Wind tunnel test of a full-scale heliostat
[SAND-79-8034] N80-14556
Systems Studies for Central Solar Thermal Electric
[CONF-780383] N80-14558

SCHOOL OF AEROSPACE MEDICINE, BROOKS AFB, TEX.
Consideration of pyridostigmine as a prophylactic agent for aircrew
N80-14730
Concepts of stress
N80-14742
Physiologic aspects of workload/fatigue/stress
N80-14744
Some insights relative to the man-machine system: An overview of ten years of research
N80-14745
Quantitative military workload analysis
N80-14748
Assessment correlates of workload and performance
N80-14758

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Acoustic implications of mesoscale oceanographic phenomena
[AD-A074456] N80-14855

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[NASA-CR-3218] N80-14356

SEGNALAMENTO MARITTIMO ED AEREO S.P.A., FLORENCE [ITALY].
Development trends of airport surface traffic control radar
N80-14087
Synthesis of linear array radiation patterns
N80-14090

SELENIA S.P.A., ROME [ITALY].
Methodology for the evaluation of a radar site
N80-14067
Performance evaluation methods of a secondary radar network
N80-14068
Tracking algorithms for mono and multiradar
N80-14074
A distributed processing system for radar data presentation
N80-14075
Filtering of synthetic radar data
N80-14076
Visual displays for air traffic control data
N80-14077
Dynamic clutter reduction techniques with moving target indicated adaptive filters
N80-14080
Performance evaluation of a coherent chain in transmission
N80-14083
Implementation of air traffic control radar receivers with fast Fourier transform processors
N80-14086
Preliminary analysis and selection criteria for an antenna for a secondary radar system
N80-14091
Antireflection techniques for detecting false tracks in air traffic surveillance with secondary radar
N80-14100
A method for the frame definition of a Discrete Address Beacon System [DABS]
N80-14102
The implementation of a Secondary Surveillance Radar [SSR]/Discrete Address Beacon System [DABS] project
N80-14103

SERVICE TECHNIQUE DE L'AERONAUTIQUE, PARIS [FRANCE].
Concerning individual equipment for fighter pilots in the Air Force
N80-14735

SINGER-KEARFOTT, WAYNE, N. J.
FORTRAN for avionics
N80-14022

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
A-3 scientific results - extragalactic
N80-14983
Optical identification and spectroscopy of X-ray sources precisely positioned with A-3
N80-14991
A high energy astronomy overview
N80-14992
Einstein observations of extended galactic X-ray sources
N80-14996
Einstein observations of active galaxies and quasars
N80-14997
The structure and evolution of X-ray clusters of galaxies
N80-14998

SOCIETE CROUZET, VALENCE [FRANCE].
A method for designing multiprocessor architectures for avionics functions
N80-14021

SOCIETE D'APPLICATIONS GENERALES D'ELECTRICITE ET DE MECANIQUE, PARIS [FRANCE].
COPRA: A new line of ultrareliable reconfigurable computers destined for onboard aerospace applications
N80-14041

SOLAR CONTROL CORP., BOULDER, COLO.
Development and testing of the Solar Control Corporation modular controller and Solarstat subsystem
[NASA-TM-78243] N80-14498

SOLAR ENERGY INFORMATION SERVICES, SAN MATEO, CALIF.
Engineers guide to solar energy
[PB-297043/2] N80-14574

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, RAPID CITY.
The T-28 thunder/hailstorm penetration aircraft
N80-14640

SOUTHAMPTON UNIV. [ENGLAND].
Acoustic equations in moving fluids
N80-14860
Mathematical techniques for acoustic propagation problems
N80-14862
Propagation in acoustically absorbent materials
N80-14865
Acoustic Energy
N80-14866
Absorption of sound waves in the atmosphere
N80-14867
Propagation from moving sources in flows
N80-14869

SOUTHERN CALIFORNIA EDISON CO., ROSEMEAD.
Commercial solar augmented heat pump system
[EPRI-ER-1004] N80-14537

SOUTHERN METHODIST UNIV., DALLAS, TEX.
Restoration and enhancement of images observed in multiplicative noise
N80-14770

SPACE SCIENCES, INC., MONROVIA, CALIF.
A mass-spectrometric investigation of the decomposition products of advanced propellants and explosives
[AD-A074963] N80-14262

SPECTRON DEVELOPMENT LABS., INC., COSTA MESA, CALIF.
Feasibility of utilizing laser Doppler velocimeter techniques in very clean wind tunnels
[AD-A074244] N80-14145
Development and application of a laser velocimeter to measure very high speed particle velocities
[AD-A073859] N80-14388

SPRINGBORN LABS., INC., ENFIELD, CONN.
Investigation of test methods, material properties, and processes for solar cell encapsulants
[NASA-CR-162542] N80-14486

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Laser fluorescene studies of chemiluminescent chemical reactions
[AD-A073829] N80-14213
Proceedings of the 1978 Coal Chemistry Workshop
[CONF-780372] N80-14264

A generalized sidelobe canceling structure for adaptive arrays
[AD-A074899] N80-14319
Aeronautic data analysis for the Houston Area Oxidant Study, volume 2
[PB-299648/6] N80-14599
Aeronautic data analysis for the Houston Area Oxidant Study. Volume 1: Executive summary
[PB-299647/8] N80-14600
Aeronautic data analysis for the Houston area oxidant study. Volume 3: Data summaries for the Houston area oxidant study
[PB-299649/4] N80-14602
STANDARD ELEKTRIK LORENZ A.G., STUTTGART [WEST GERMANY].
Digital array signal processing techniques applied to guidance and navigation
N80-14032
STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Microcomputer-based monitoring and control system
[SLAC-TN-79-3] N80-14798
Topics in the QCD phenomenology of deep-inelastic scattering
[SLAC-PUB-2296] N80-14950
STANFORD UNIV., CALIF.
Recent investigations of metal oxide/CdTe heterojunction solar cells
[CONF-780619-25] N80-14564
Stochastic modeling of the time-averaged equations for climate dynamics
[NASA-CR-162527] N80-14653
Search. A section of the handbook of artificial intelligence
[AD-A074078] N80-14797
Effects of friction and heat conduction on sound propagation in ducts
[NASA-CR-162556] N80-14842
Quantum field theory methods applied to the physics of condensed matter
[AD-A073509] N80-14940
The preparation and characterization of InP and related 3-5 single crystals and epitaxial layers produced by molten salt electrolysis
[AD-A073421] N80-14942
STATE UNIV. OF NEW YORK AT STONY BROOK.
Spectral invariance for normal operators under trace class perturbations
N80-14803
A study of P Cygni stars
N80-15001
STATE UNIV. OF NEW YORK COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY, SYRACUSE.
The mapping of important farmland using remote sensor and socio-economic variables
N80-14434
STEVENS INST. OF TECH., HOBOKEN, N. J.
Determination of the velocity-field characteristic of gallium arsenide from Franz-Keldysh electroabsorption
N80-14331
STUTTGART UNIV. [WEST GERMANY].
Soft X-ray measurements for investigating plasma focus dynamics
[IPF-78-1] N80-14925
Measurement of the ion profile by stationary CO2 laser scattering from a hydrogen plasma
[IPF-78-5] N80-14926
Non-axial-symmetric Alfven waves in cylindrical, radial inhomogeneous plasmas
[IPF-78-6] N80-14927
Light scattering from an arc plasma with stationary CO2 laser and heterodyne detection
[IPF-78-8] N80-14928
SYRACUSE UNIV., N. Y.
Thermal stress analysis of glass seals in microelectronic packages under thermal shock conditions
[AD-A073654] N80-14342
SYSTEMS TECHNOLOGY, INC., HAWTHORNE, CALIF.
Modeling biodynamic effects of vibration, fifth year
[AD-A073819] N80-14719

T

TECHNICAL UNIV. OF DENMARK, LYNGBY.
Finite-amplitude wave propagation
N80-14874
Nonlinear interaction of finite-amplitude sound waves
N80-14875
TECHNISCHE UNIVERSITAET, BRUNSWICK [WEST GERMANY].
The decomposition of mixtures and classification using the gradient technique
[BMVG-FBWT-79-07] N80-14799
TENNESSEE UNIV., KNOXVILLE.
Classical theory of radiative transitions
N80-14285
Simulation approach for base-line energy-using analysis
[CONF-790459-22] N80-14511
TENNESSEE UNIV. SPACE INST., TULLAHOMA.
Proceedings, Third Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems
[NASA-CP-2104] N80-14633
Current research on aviation weather [bibliography], 1979
[NASA-CR-3214] N80-14651
TEXAS TECHNOLOGICAL UNIV., LUBBOCK.
Groundwater resources of the Texas high plains: State-of-the-art and future research needs
[PB-298147/0] N80-14469
TEXAS UNIV. AT AUSTIN.
An electron diffraction study of laser excited sulfur hexafluoride
N80-14207
Polystyrene in mixed solvents
N80-14245
Discrete time detection of signals in dependent non-Gaussian noise
N80-14283
A multiple species ion energy analyzer applied to laser-induced plasma experiments
N80-14909
Vacuum polarization in curved spacetime
N80-14951
THERMACORE, INC., LEOLA, PA.
Meteoroid protection methods for spacecraft radiators using heat pipes
[NASA-CR-162545] N80-14185
TOULOUSE UNIV. [FRANCE].
Study of the transformation of synthetic and polypropylene fibers undergoing electrical discharges at high pressure
[PUBL-369] N80-14201
The use of chelates to neutralize defects giving rise to partial discharges in insulating materials other than polyethylene: The particular case of epoxy resins
[PUBL-379] N80-14255
TRIESTE UNIV. [ITALY].
Automatic systems for airport surface mobile media surveillance based on the use of secondary media
N80-14104
General criteria for the design of repeating stations of circular waveguide systems
N80-14296
TRW DEFENSE AND SPACE SYSTEMS GROUP, REDONDO BEACH, CALIF.
A three dimensional vortex wake model for missiles at high angles on attack
[NASA-CR-3208] N80-14048
TWENTE UNIV. OF TECHNOLOGY, ENSCHEDE [NETHERLANDS].
Methods for strap-down attitude estimation and navigation with accelerometers
N80-14034

U

UNITED TECHNOLOGIES CORP., SUNNYVALE, CALIF.
The development of improved normal stress transducers for propellant grains, volume 1
[AD-A073659] N80-14260
The development of improved normal stress transducers for propellant grains. Volume 2: Appendices
[AD-A073660] N80-14261
UNITED TECHNOLOGIES RESEARCH CENTER, EAST HARTFORD, CONN.
High temperature UF6 RF plasma experiments applicable to uranium plasma core reactors
[NASA-CR-159159] N80-14921
UNIVERSAL SYSTEMS, INC., ARLINGTON, VA.
Oblique detonation wave ramjet
[NASA-CR-159192] N80-14131
UNIVERSITE DE TECHNOLOGIE DE COMPIEGNE [FRANCE].
A general survey of studies on acoustic wave propagation
N80-14859
Propagation in ducts
N80-14864
UNIVERSITY COLL. OF SWANSEA [WALES].
Low temperature lubrication
[STC-78/376] N80-14404
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Validation and error in multiplicative utility functions
[AD-A073362] N80-14698
A criterion validation of multiattribute utility analysis and of a group communication strategy
[AD-A073364] N80-14699
Importance weight assessment for additive, riskless preference functions: A review
[AD-A073365] N80-14700
Are important weights sensitive to the range of alternatives in multiattribute utility measurement
[AD-A073366] N80-14701
Subjective versus statistical importance weights. A criterion validation
[AD-A073367] N80-14702
Growth and characterization of epitaxial piezoelectric and semiconductor films
[AD-A073813] N80-14943
URBAN INST., WASHINGTON, D.C.
Fire-code inspections and fire prevention: What methods lead to success
[PB-299991/1] N80-14276
UTAH UNIV., SALT LAKE CITY.
Catalytic-synthesis of light hydrocarbons from carbon monoxide/hydrogen over metal catalysts
N80-14204
A constant percentage bandwidth transform for acoustic signal processing
N80-14280
Imaging in a Fabry-Perot interferometer
N80-14898

V

VANDERBILT UNIV., NASHVILLE, TENN.
The role of phosphorus in the intergranular embrittlement of Fe-3Si
N80-14230
A microprocessor-based random-dot stereogram system
N80-14768
VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 1: Model development and applications, part B
[NASA-CR-160355] N80-14339
Numerical simulation of dynamics of brushless dc motors for aerospace and other applications. Volume 2: User's guide to computer EMA model
[NASA-CR-160356] N80-14340
Aircrew workload assessment techniques
N80-14746
VIRGINIA UNIV., CHARLOTTESVILLE.
Magnus effect on spinning bodies of revolution
N80-14044
Microstructural investigation of polycrystalline iron whiskers
[AD-A074708] N80-14198
Charge-coupled device architectures for signal processing
N80-14334
New laser dye systems based on luminescent transition metal complexes
[AD-A074245] N80-14392
An investigation of the power efficiency of the Friedman nonparametric anova test with respect to the one factor repeated measures anova F-test
N80-14825
Experimental studies of metal-ammonia solutions; Raman scattering and susceptibility
N80-14930
Dynamic dislocation phenomena in single crystals of alpha-phase binary and ternary copper alloys
N80-14932
Studies of interplanetary dust
N80-15006
VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE [BELGIUM].
Fundamentals of sound reflection and refraction in inhomogeneous media
N80-14861

W

WASHINGTON UNIV., SEATTLE.
Vibrational spectra of solid ethane; vibrational spectra of diborane in an argon matrix
N80-14203
Pseudopolarographic determination of metal complex stability constants in dilute solution by rapid scan anodic stripping voltammetry
[AD-A074806] N80-14216
Simultaneous multiple camera and multiple focal setting self-calibration in photogrammetry
N80-14372
Remote sensing of microparticles by laser scattering for medical applications: Approach with transport theory and picosecond optical range-gating
N80-14385
A box model study for global and regional sulfur circulations
N80-14580
Crustal deformation in central California: Multi-wavelength geodetic observations and interpretations
N80-14605
The implication of Pn amplitudes for velocity gradients in the uppermost oceanic mantle
N80-14606
Sea breezes on the Alaskan arctic coast
N80-14632
The Megaprocessor: A multiple-processor architecture based upon expression tree pipelining
N80-14759
Contributions to constrained optimization
N80-14801
Strong shape theory
N80-14802
Collisional relaxation of transient vibrational energy distributions in a thermal unimolecular system: The variable encounter method
[AD-A074163] N80-14880

Ordering transitions in helium-4 submonolayers: A heat capacity study
N80-14934

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Monolithic transformation of ceramic materials from metal-organic sols and gels
[AD-A074181] N80-14252

WESTLAND HELICOPTERS LTD., YEOVIL [ENGLAND].
Experience in producing software for the ground station of a remotely piloted helicopter system
N80-14038

WILLIAMS COLL., WILLIAMSTOWN, MASS.
Effects of hydrogen atom spin exchange collisions on atomic hydrogen maser oscillation frequency
[NASA-CR-162525] N80-14878

WISCONSIN UNIV. - MADISON.
The generalized phase shift approach to rotational excitation in dilute diatomic gases
N80-14202

Spectroscopic investigations of cathode electrode vapor excitation and propagation in high voltage spark discharges
N80-14206

Hydrodynamic and electrostatic characterization of particles by light scattering
N80-14209

Measurement of fluid motion in a diesel engine cylinder by use of a tracer gas technique
N80-14399

Stretching the circular cylindrical elastic sheet
N80-14800

Ultrasonic broad band pulse-echo beam profile analysis in nonattenuating and attenuating media
N80-14839

Molecular reaction rates
[AD-A073851] N80-14882

WISCONSIN UNIV. - MILWAUKEE.
Unsteady flow and dynamic response analyses for helicopter rotor blades
[NASA-CR-159190] N80-14355

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Volatile organic compounds in seawater
[AD-A074179] N80-14214

WORLD METEOROLOGICAL ORGANIZATION, GENEVA [SWITZERLAND].
Report of the Fifth Planning Meeting for the Monsoon Experiment MONEX. Part 2: Summer MONEX
[GARP-SPEC-REPT-32] N80-14656

Report of the Second Session of the WAMEX Scientific and Management Regional Committee
[GARP-SPEC-REPT-33] N80-14657

World Weather Watch. Regional association 4 [North and Central America] hurricane operational plan
[WMO-524] N80-14658

World Weather Watch. WMO tropical cyclone project, subproject no. 6. Operational techniques for forecasting tropical cyclone intensity and movement
[WMO-528] N80-14659

Compendium of meteorology for use by class one and class two meteorological personnel. Volume 2, part 3: Marine meteorology
[WMO-364] N80-14660

WYLE LABS., INC., HUNTSVILLE, ALA.
Thermal performance evaluation of the Suncatcher SH-11 [liquid] solar collector
[NASA-CR-161253] N80-14497

Results of thermal performance evaluation of the Owens-Illinois sunpack liquid solar collector at indoor conditions
[NASA-CR-161189] N80-14500

X

XAVIER UNIV. OF LOUISIANA, NEW ORLEANS.
Calculation of total cross sections for charge exchange in molecular collisions
[NASA-CR-162560] N80-14879

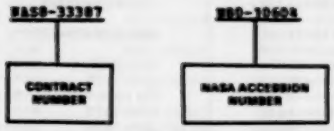
Y

YALE UNIV., NEW HAVEN, CONN.
Optoelectronic properties of metal-tunnel oxide-silicon junctions
N80-14336

Knowledge-based parsing
[AD-A068646] N80-14774

Boolean valued models and Galois theory for commutative regular rings
N80-14832

Typical Contract Number Index Listing



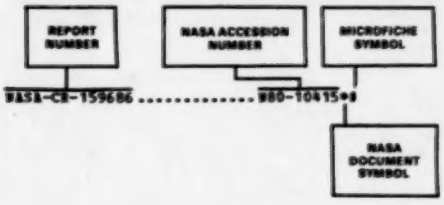
Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

ACUREX PROJ. 6457
N80-14182
ACUREX PROJ. 7396
N80-14184
AF PROJ. 2029
N80-14310
AF PROJ. 2301
N80-14213
AF PROJ. 2303
N80-14387
N80-14392
AF PROJ. 2304
N80-14313
N80-14318
N80-14796
AF PROJ. 2305
N80-15004
AF PROJ. 2306
N80-14342
N80-14943
N80-14946
AF PROJ. 2308
N80-14190
N80-14222
AF PROJ. 2310
N80-14882
AF PROJ. 2312
N80-14695
N80-14712
N80-14719
AF PROJ. 2313
N80-14709
AF PROJ. 2404
N80-14145
N80-14146
N80-14388
AF PROJ. 3145
N80-14505
N80-14506
AF PROJ. 4506
N80-14302
AF PROJ. 4519
N80-14323
AF PROJ. 4600
N80-14317
N80-14321
AF PROJ. 5550
N80-14761
N80-14762
AF PROJ. 5730
N80-14192
N80-14260
N80-14261
AF PROJ. 6244
N80-14775
N80-14776
AF PROJ. 7184
N80-14692
N80-14703
N80-14721
AF PROJ. 7231
N80-14690
N80-14848
N80-14849
N80-14850
N80-14851
AF PROJ. 7381
N80-14852
AF-AFOSR-2900-76
N80-14709
AF-AFOSR-3039-76
N80-14387
AF-AFOSR-3235-77
N80-14943
AF-AFOSR-3283-77
N80-14946
AF-AFOSR-3288-77
N80-14712
AF-AFOSR-3590-78
N80-14392
AF-AFOSR-3619-78
N80-14318
AF-AFOSR-3715-78
N80-14313
ARPA ORDER 512
N80-14614
ARPA ORDER 2415
N80-14393
ARPA ORDER 2646
N80-14901
ARPA ORDER 3423
N80-14797
ARPA ORDER 3460
N80-14779
ARPA ORDER 3487
N80-14964
ARPA ORDER 3515
N80-14315
AT(29-1)-789 N80-14558
BCS-80061 N80-14137
BNWG-GF-78 N80-14326
BNWG-T/EF-37/71501/71300
N80-14780
DA PROJ. 1L1-61102-AH-60
N80-14215
DA PROJ. 1L1-61102-B-53A
N80-14653
DA PROJ. 1L2-62209-AH-76
N80-14840
DA PROJ. 1R7-65706-B-S41
N80-14777
DA PROJ. 1T6-65804-DE-93
N80-14171
DA PROJ. 3E1-62720-A-835
N80-14583
DA PROJ. 3E1-62777-A-845
N80-14691
DA-1 N80-14602
DAAD07-77-C-0094
N80-14171
DAAG29-76-G-0053
N80-14940
DAAG29-76-G-0160
N80-14854
DAAG29-76-G-0284
N80-14320
DAAG29-77-C-0029
N80-14252
DAAG29-77-G-0109
N80-14942
DAAG29-77-G-0232
N80-14324
DAAG29-78-G-0050
N80-14854
DAAG29-78-G-0098
N80-14391
DAAK40-76-C-0198
N80-14960
DAAK40-78-C-0117
N80-14906
DAAK40-78-C-0226
N80-14172
DAAK50-78-C-0008
N80-14111
DAAK70-77-C-0109
N80-14903
DAAK70-77-C-0203
N80-14458
DAAD17-78-C-8073
N80-14583
DARPA ORDER 2303
N80-14308
DA9060-78-C-0146
N80-14217
DCA100-76-C-0089
N80-14305
N80-14306
DCA100-79-C-0001
N80-14312
DE-AC04-76DP-00487
N80-14407
DE-AI01-79ET-20307
N80-14491
DE-AT03-76ET-35300
N80-14421
DGRST-73-7-1013
N80-14243
DGRST-75-7-0968
N80-14135
DGRST-75-7-0992
N80-14243
DI-AA55-CT7-34
N80-14588
N80-14589
DNA001-77-C-0098
N80-14199
DOT-FA77WAI-817
N80-14064
DOT-FA78WAI-925
N80-14256
DOT-RS-6-01331
N80-14695
DOT-TSC-BA-76-48
N80-14976
EC-77-A-31-1035
N80-14572
EC-77-C-01-5043
N80-14510
EC-77-C-02-4236
N80-14364
EC-77-S-02-4372
N80-14587
EE-77-S-02-4204
N80-14266
EE-77-S-02-4447
N80-14266
EE-77-S-02-4548
N80-14266
EP-77-A-01-2593
N80-14493
EP-77-A-01-2674
N80-14922
EG-77-C-01-2522
N80-14539
EG-77-C-01-4022
N80-14559
EG-77-C-01-4024
N80-14478
N80-14566
EG-77-C-01-4042
N80-14269
N80-14518
N80-14519
N80-14520
N80-14546
N80-14547
N80-14548
N80-14617
EG-77-D-05-5550
N80-14553
N80-14554
N80-14555
EM-78-C-03-1735
N80-14523
EM-78-S-02-4628
N80-14516
EM-77-C-03-1464
N80-14836
EP-78-C-02-4734
N80-14266
EP-78-C-03-2057
N80-14266
EP-78-C-05-6020
N80-14266
EPA PROJ. EHE624A
N80-14590
N80-14591
EPA-IAG-D7-0053
N80-14676
EPA-R-805003 N80-14696
EPA-R-805095-01
N80-14967
EPA-R-805228 N80-14593
EPA-S-800773 N80-14596
EPA-68-01-1916
N80-14463
N80-14464
N80-14465
N80-14466
N80-14467
N80-14468
EPA-68-02-2138
N80-14595
EPA-68-02-2628
N80-14590
N80-14591
EPA-68-02-2711
N80-14594
EPA-68-02-3011
N80-14592
ER-78-S-02-5002
N80-14947
N80-14948
N80-14949
ESA-2448/74-NP
N80-14380
ESOC-3217/77 N80-14166
ESTEC-1327/74-NP-EIDER-1
N80-14785
ESTEC-2117/73-AK
N80-14195
ESTEC-2327/74-NP
N80-14782
N80-14783
N80-14784
N80-14786
ESTEC-3264/77-NL-PP(SC)
N80-14404
ET-78-C-03-2028
N80-14550
N80-14551
ET-78-I-01-3112
N80-14358
ET-78-X-01-2482
N80-14264
EX-76-A-29-1012
N80-14490
EX-76-A-36-1008
N80-14578
EX-76-C-01-2435
N80-14258
EY-76-C-02-0016
N80-14512
N80-14514
N80-14522
N80-14552
N80-14586
N80-14890
N80-14897
EY-76-C-02-2271
N80-14884
N80-14896
EY-76-C-02-2900
N80-14268

EY-76-C-02-3073
NBD-15024
EY-76-C-03-0063
NBD-14888
EY-76-C-03-0515
NBD-14798
NBD-14950
EY-76-C-03-0700
NBD-14563
EY-76-C-04-0053
NBD-14540
NBD-14541
NBD-14570
EY-76-C-04-0613
NBD-14765
EY-76-C-04-0789
NBD-14241
NBD-14420
NBD-14513
NBD-14527
NBD-14532
NBD-14536
NBD-14556
NBD-14557
NBD-14558
EY-76-C-06-1830
NBD-14227
NBD-14266
NBD-14534
NBD-14655
EY-76-C-07-1570
NBD-14238
NBD-14347
NBD-14361
NBD-14363
EY-76-C-08-1183
NBD-14394
NBD-14907
EY-76-S-02-2577
NBD-14568
EY-76-S-02-2858
NBD-14569
EY-76-S-02-2893
NBD-14520
EY-76-S-02-2917
NBD-14270
EY-76-S-03-0326
NBD-14564
EY-76-S-05-5126
NBD-14895
EY-76-S-06-2229
NBD-14619
EY-76-Y-06-1830
NBD-14223
FAA PROJ. 052-241-04
NBD-14064
F04611-75-C-0042
NBD-14260
NBD-14261
F04611-78-C-0002
NBD-14192
F04701-76-C-0001
NBD-14178
F04701-78-C-0124
NBD-14106
F09603-78-C-4125
NBD-14345
F19628-73-C-0274
NBD-14882
F19628-75-C-0057
NBD-14393
F19628-78-C-0002
NBD-14309
NBD-14310
NBD-14614
F19628-78-C-0136
NBD-14315
F30602-77-C-0021
NBD-14901
F30602-77-C-0039
NBD-14323
F30602-77-C-0052
NBD-14761
NBD-14762
F30602-78-C-0077
NBD-14775
NBD-14776
F30602-78-C-0083
NBD-14342
F30602-78-C-0129
NBD-14302
F33615-76-C-0505
NBD-14695
F33615-76-C-2074
NBD-14506
F33615-76-C-3145
NBD-14145
NBD-14146
NBD-14380
F33615-76-F-6751
NBD-14852
F33615-77-C-2004
NBD-14504
F33615-77-C-2021
NBD-14505
F33615-77-C-3036
NBD-14026
F33615-78-C-0508
NBD-14721
F33615-79-C-0511
NBD-14692
F40600-77-C-0007
NBD-14218
F40620-73-C-0075
NBD-14719
F40620-75-C-0083
NBD-14213
F49620-77-C-0111
NBD-14222
F49620-79-C-0056
NBD-14796
JPL PROJ. 5101-35
NBD-14405
JPL PROJ. 5101-137
NBD-14490
JPL PROJ. 5102-117
NBD-14491
JPL PROJ. 5102-136
NBD-14488
JPL PROJ. 5230-7-REV-2
NBD-14492
JPL-954328 NBD-14483
JPL-954527 NBD-14486
JPL-954830 NBD-14273
JPL-954878 NBD-14485
JPL-955018 NBD-14484
JPL-955149 NBD-14481
NBD-14482
JPL-955437 NBD-14185
NDA903-77-C-0322
NBD-14797
NDA903-78-C-0029
NBD-14779
NASA ORDER L-55450-A
NBD-14257
NASA ORDER L-69159-A
NBD-14257
NASW-2691 NBD-14018
NASW-3134 NBD-15003
NASW-3198 NBD-14671
NBD-14680
NBD-14716
NBD-14717
NASW-3199 NBD-14248
NBD-14672
NBD-14673
NBD-14674
NBD-15023
NAS1-14193 NBD-14053
NAS1-14329 NBD-14921
NAS1-14464 NBD-14212
NAS1-15103 NBD-14197
NAS1-15119 NBD-14760
NAS1-15128 NBD-14056
NBD-14773
NAS1-15158 NBD-14815
NAS1-15238 NBD-14359
NAS1-15341 NBD-14354
NAS1-15344 NBD-14131
NAS1-15346 NBD-14137
NAS1-15640 NBD-14816
NAS2-9579 NBD-14048
NAS2-9909 NBD-14184
NAS3-18021 NBD-14115
NBD-14116
NBD-14117
NBD-14118
NBD-14119
NBD-14120
NAS3-19754 NBD-14130
NAS3-20057 NBD-14129
NAS3-20073 NBD-14235
NAS3-20082 NBD-14122
NAS3-20290 NBD-14182
NAS3-20629 NBD-14127
NAS3-21003 NBD-14356
NAS3-21029 NBD-14189
NAS3-21149 NBD-14386
NAS3-30363 NBD-14480
NAS7-100 NBD-14150
NBD-14773
NBD-14211
NBD-14358
NBD-14405
NBD-14486
NBD-14488
NBD-14489
NBD-14490
NBD-14491
NBD-14492
NBD-14675
NBD-14689
NBD-14956
NASW-30753 NBD-14999
NBD-15000
NASW-32036 NBD-14497
NBD-14500
NASW-32256 NBD-14496
NASW-32258 NBD-14498
NASW-32652 NBD-14633
NBD-14651
NAS9-14044 NBD-14775
NAS9-14818 NBD-14164
NAS9-15091 NBD-14339
NBD-14340
NAS9-15218 NBD-14718
NAS9-15800 NBD-14772
NAS9-15969 NBD-14176
NAS9-15970 NBD-14187
NAS9-15971 NBD-14179
NBS-0-3631 NBD-14767
NEI-BOI-EY-00680
NBD-14713
NGL-05-020-275
NBD-14842
NGI-05-020-526
NBD-14842
NGR-50-007-001
NBD-14355
NIH-RR-00785-06
NBD-14797
NOAA-04-7-158-44104
NBD-14214
NOAA-04-8-R01-149
NBD-14214
NOAA-04-78-R01-18
NBD-14661
NR PROJ. 042-291
NBD-14314
NR PROJ. 049-345
NBD-14963
NR PROJ. 053-640
NBD-14251
NR PROJ. 056-607
NBD-14219
NR PROJ. 083-275
NBD-14666
NR PROJ. 088-076
NBD-14319
NR PROJ. 092-549
NBD-14880
NR PROJ. 170-855
NBD-14705
NR PROJ. 346-675
NBD-14250
NRL PROJ. R01-29
NBD-14902
NRL PROJ. R02-105
NBD-14311
NSF APR-76-19148
NBD-14276
NSF ATM-77-23757
NBD-14831
NSF CISP-78-22989
NBD-14962
NSF DMR-76-20662
NBD-14948
NBD-14949
NSF DMR-76-80847
NBD-14251
NSF ENG-77-20799
NBD-14314
NSF GI-32882 NBD-14471
NSF MCS-78-23676
NBD-14764
NSF OCE-22781
NBD-14214
NSF PFR-78-22878
NBD-14277
NSG-1120 NBD-14357
NSG-1357 NBD-14054
NSG-1361 NBD-14879
NSG-1471 NBD-14791
NSG-1498 NBD-14290
NSG-1537 NBD-14052
NSG-1617 NBD-14814
NSG-2007 NBD-14882
NSG-2140 NBD-14047
NSG-3196 NBD-14923
NSG-3237 NBD-14487
NSG-5218 NBD-14878
NSG-5254 NBD-14652
NSG-7106 NBD-14900
NSG-9039 NBD-15011
NDD014-74-C-0262
NBD-14214
NDD014-75-C-0536
NBD-14216
NDD014-75-C-0609
NBD-14314
NDD014-75-C-0690
NBD-14880
NDD014-75-C-0691
NBD-14198
NDD014-75-C-0884
NBD-14706
NBD-14707
NBD-14708
NBD-14710
NDD014-75-C-0930
NBD-14319
NDD014-75-C-0986
NBD-14262
NDD014-75-C-1111
NBD-14774
NDD014-75-C-1179
NBD-14219
NDD014-76-C-0074
NBD-14698
NBD-14699
NBD-14700
NBD-14701
NBD-14702
NDD014-76-C-0189
NBD-14713
NDD014-76-C-0370
NBD-14764
NDD014-76-C-0442
NBD-14502
NBD-14503
NDD014-76-C-0889
NBD-14220
NDD014-77-C-0231
NBD-14251
NDD014-77-C-0253
NBD-14062
NDD014-77-C-0366
NBD-14221
NDD014-77-C-0498
NBD-14705
NDD014-77-C-0553
NBD-14881
NDD014-77-C-0617
NBD-14311
NDD014-77-C-0696
NBD-14855
NDD014-78-C-0245
NBD-14250
NDD014-78-C-0430
NBD-14720
NDD014-78-C-0548
NBD-14418
NDD014-78-C-0547
NBD-14417
NDD014-78-C-0580
NBD-14236

N00014-78-C-0692
N80-14303
N00014-78-C-0778
N80-14314
N00014-78-C-0791
N80-14344
N00014-79-C-0042
N80-14664
N00019-78-C-0406
N80-14945
N00019-79-C-0291
N80-14307
N00024-79-C-6043
N80-14845
N80-14846
N80-14847
N00039-78-C-0160
N80-14778
N80-14965
N80-14966
N00228-76-C-3174
N80-14654
N60530-78-C-0272
N80-14191
N61339-77-C-0167
N80-14753
N62269-79-C-0204
N80-14132
N68305-77-C-0005
N80-14615
NR0210541 N80-14304
NR0310343 N80-14665
NR0420402 N80-14706
N80-14707
N80-14708
N80-14710
SFB-78 N80-14461
SRI PROJ. 7106
N80-14599
N80-14600
N80-14602
USFA-C-7-35563
N80-14275
W-31-109-ENG-38
N80-14228
N80-14237
N80-14263
N80-14265
N80-14271
N80-14365
N80-14525
N80-14530
N80-14531
N80-14562
N80-14573
N80-14889
N80-14954
N80-15016
W-7405-ENG-26
N80-14242
N80-14254
N80-14362
N80-14408
N80-14509
N80-14511
N80-14924
W-7405-ENG-36
N80-14173
N80-14346
N80-14526
N80-14535
N80-14584
N80-14620
N80-14817
N80-14856
N80-14893
N80-15014
N80-15015
W-7405-ENG-38
N80-14240
W-7405-ENG-48
N80-14225
N80-14226
N80-14253
N80-14267
N80-14348
N80-14379
N80-14419
N80-14517
N80-14528
N80-14529
N80-14533
N80-14569
N80-14571
N80-14585
N80-14857
N80-14883
N80-14885
N80-14886
N80-14887
N80-14952
N80-14973
W-7405-ENG-82
N80-14208
N80-14953
WF52551000 N80-14654
WF52553000 N80-14665
WO6130000 N80-14378
ZW323910 N80-14902
ZF52552003 N80-14840
ZF57571004 N80-14259
ZR00001 N80-14892
ZR01109 N80-14892
152-85-00-00-72
N80-15012
352-03-03-02-00-21
N80-14941
505-03 N80-14125
505-04 N80-14124
N80-14403
505-06-31 N80-14047
505-06-63-03 N80-14136
505-10-23-05 N80-14840
505-31-53-01 N80-14257
505-33-43-02 N80-14771
505-34-13-02 N80-14209
505-34-33-02 N80-14139
505-35-23-01 N80-14697
505-41-13-03 N80-14110
505-42-13-04 N80-14816
506-61-73-04 N80-14163
513-52-01-16 N80-14114
769-02 N80-14121

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A-7939 ..... N80-14049*#
A-7975 ..... N80-14108*
A-7996 ..... N80-14138*#
A-8047 ..... N80-14941*#

AAAP-RT-79-12 ..... N80-14059 #

ACUREX-78-284 ..... N80-14182*#

AD-A068658 ..... N80-14704 #
AD-A068665 ..... N80-14705 #
AD-A068666 ..... N80-14774 #
AD-A068863 ..... N80-14964 #
AD-A068891 ..... N80-14706 #
AD-A068893 ..... N80-14707 #
AD-A068894 ..... N80-14708 #
AD-A068906 ..... N80-14709 #
AD-A068922 ..... N80-14710 #
AD-A068988 ..... N80-14711 #
AD-A069001 ..... N80-14712 #
AD-A069016 ..... N80-14957 #
AD-A069017 ..... N80-14958 #
AD-A069018 ..... N80-14959 #
AD-A070806 ..... N80-14111 #
AD-A071170 ..... N80-14695 #
AD-A071310 ..... N80-14690 #
AD-A071803 ..... N80-14693 #
AD-A072353 ..... N80-14721 #
AD-A072497 ..... N80-14720 #
AD-A072671 ..... N80-14694 #
AD-A072723 ..... N80-14796 #
AD-A072726 ..... N80-14713 #
AD-A072990 ..... N80-14302 #
AD-A073229 ..... N80-14064 #
AD-A073237 ..... N80-14256 #
AD-A073290 ..... N80-14304 #
AD-A073314 ..... N80-14112 #
AD-A073315 ..... N80-14963 #
AD-A073318 ..... N80-14892 #
AD-A073356 ..... N80-14306 #
AD-A073358 ..... N80-14761 #
AD-A073359 ..... N80-14762 #
AD-A073362 ..... N80-14698 #
AD-A073364 ..... N80-14699 #
AD-A073365 ..... N80-14700 #
AD-A073366 ..... N80-14701 #
AD-A073367 ..... N80-14702 #
AD-A073375 ..... N80-14965 #
AD-A073376 ..... N80-14966 #
AD-A073421 ..... N80-14942 #
AD-A073429 ..... N80-14305 #
AD-A073457 ..... N80-14415 #
AD-A073484 ..... N80-14144 #
AD-A073491 ..... N80-14846 #
AD-A073509 ..... N80-14940 #
AD-A073520 ..... N80-14190 #
AD-A073557 ..... N80-14891 #

AD-A073604 ..... N80-14703 #
AD-A073616 ..... N80-14848 #
AD-A073617 ..... N80-14850 #
AD-A073618 ..... N80-14851 #
AD-A073640 ..... N80-14901 #
AD-A073652 ..... N80-14775 #
AD-A073653 ..... N80-14776 #
AD-A073658 ..... N80-14342 #
AD-A073659 ..... N80-14260 #
AD-A073660 ..... N80-14261 #
AD-A073681 ..... N80-14106 #
AD-A073703 ..... N80-14303 #
AD-A073704 ..... N80-14191 #
AD-A073761 ..... N80-14259 #
AD-A073762 ..... N80-14844 #
AD-A073763 ..... N80-14902 #
AD-A073772 ..... N80-14614 #
AD-A073775 ..... N80-14845 #
AD-A073793 ..... N80-14849 #
AD-A073813 ..... N80-14943 #
AD-A073818 ..... N80-14847 #
AD-A073819 ..... N80-14719 #
AD-A073829 ..... N80-14213 #
AD-A073851 ..... N80-14882 #
AD-A073856 ..... N80-14506 #
AD-A073858 ..... N80-14505 #
AD-A073859 ..... N80-14388 #
AD-A073871 ..... N80-14194 #
AD-A073872 ..... N80-14390 #
AD-A073878 ..... N80-14250 #
AD-A073955 ..... N80-14946 #
AD-A073964 ..... N80-14322 #
AD-A074001 ..... N80-14406 #
AD-A074018 ..... N80-14310 #
AD-A074047 ..... N80-14323 #
AD-A074055 ..... N80-14219 #
AD-A074078 ..... N80-14797 #
AD-A074082 ..... N80-14309 #
AD-A074085 ..... N80-14320 #
AD-A074089 ..... N80-14387 #
AD-A074157 ..... N80-14318 #
AD-A074160 ..... N80-14854 #
AD-A074163 ..... N80-14880 #
AD-A074166 ..... N80-14236 #
AD-A074178 ..... N80-14945 #
AD-A074179 ..... N80-14214 #
AD-A074181 ..... N80-14252 #
AD-A074183 ..... N80-14881 #
AD-A074186 ..... N80-14663 #
AD-A074187 ..... N80-14133 #
AD-A074220 ..... N80-14222 #
AD-A074233 ..... N80-14853 #
AD-A074244 ..... N80-14145 #
AD-A074245 ..... N80-14392 #
AD-A074264 ..... N80-14215 #
AD-A074298 ..... N80-14313 #
AD-A074313 ..... N80-14316 #
AD-A074369 ..... N80-14665 #
AD-A074378 ..... N80-14616 #
AD-A074388 ..... N80-14378 #
AD-A074390 ..... N80-14063 #
AD-A074391 ..... N80-14147 #
AD-A074395 ..... N80-14653 #
AD-A074427 ..... N80-14312 #
AD-A074446 ..... N80-14763 #
AD-A074449 ..... N80-14960 #
AD-A074455 ..... N80-14764 #
AD-A074456 ..... N80-14855 #
AD-A074469 ..... N80-14057 #
AD-A074474 ..... N80-14321 #
AD-A074475 ..... N80-14317 #
AD-A074478 ..... N80-14134 #
AD-A074485 ..... N80-14324 #
AD-A074487 ..... N80-14905 #
AD-A074488 ..... N80-14418 #
AD-A074491 ..... N80-14417 #
AD-A074497 ..... N80-14315 #
AD-A074523 ..... N80-14186 #
AD-A074526 ..... N80-14389 #
AD-A074538 ..... N80-14251 #

REPORT

AD-A074540 ..... MBB-15004 @
AD-A074558 ..... MBB-14307 @
AD-A074567 ..... MBC-14220 @
AD-A074569 ..... MBB-14314 @
AD-A074570 ..... MBB-14217 @
AD-A074593 ..... MBB-14062 @
AD-A074595 ..... MBB-14132 @
AD-A074605 ..... MBB-14343 @
AD-A074606 ..... MBB-14308 @
AD-A074610 ..... MBB-14779 @
AD-A074635 ..... MBB-14146 @
AD-A074639 ..... MBB-14192 @
AD-A074653 ..... MBB-14903 @
AD-A074700 ..... MBB-14198 @
AD-A074719 ..... MBB-14344 @
AD-A074723 ..... MBB-14692 @
AD-A074724 ..... MBB-14852 @
AD-A074731 ..... MBB-14664 @
AD-A074741 ..... MBB-14906 @
AD-A074742 ..... MBB-14904 @
AD-A074764 ..... MBB-14777 @
AD-A074772 ..... MBB-14654 @
AD-A074782 ..... MBB-14172 @
AD-A074799 ..... MBB-14458 @
AD-A074803 ..... MBB-14834 @
AD-A074806 ..... MBB-14216 @
AD-A074809 ..... MBB-14666 @
AD-A074825 ..... MBB-14218 @
AD-A074829 ..... MBB-14583 @
AD-A074866 ..... MBB-14722 @
AD-A074869 ..... MBB-14504 @
AD-A074871 ..... MBB-14615 @
AD-A074878 ..... MBB-14170 @
AD-A074883 ..... MBB-14377 @
AD-A074889 ..... MBB-14199 @
AD-A074893 ..... MBB-14507 @
AD-A074894 ..... MBB-14345 @
AD-A074899 ..... MBB-14319 @
AD-A074906 ..... MBB-14061 @
AD-A074911 ..... MBB-14778 @
AD-A074913 ..... MBB-14944 @
AD-A074914 ..... MBB-14193 @
AD-A074915 ..... MBB-14503 @
AD-A074932 ..... MBB-14311 @
AD-A074946 ..... MBB-14416 @
AD-A074947 ..... MBB-14171 @
AD-A074951 ..... MBB-14391 @
AD-A074953 ..... MBB-14221 @
AD-A074963 ..... MBB-14262 @
AD-A074968 ..... MBB-14502 @
AD-A074979 ..... MBB-14691 @
AD-A075008 ..... MBB-14393 @

AD-E000311 ..... MBB-14304 @
AD-E000316 ..... MBB-14259 @
AD-E000317 ..... MBB-14844 @
AD-E000318 ..... MBB-14902 @
AD-E000321 ..... MBB-14665 @
AD-E100271 ..... MBB-14305 @
AD-E100272 ..... MBB-14306 @
AD-E100278 ..... MBB-14312 @
AD-E300594 ..... MBB-14199 @
AD-E430294 ..... MBB-14316 @
AD-E430296 ..... MBB-14215 @

ADL-C-82426 ..... MBB-14583 @

AEDC-TR-79-28-VOL-3 ..... MBB-14193 @
AEDC-TR-79-39 ..... MBB-14134 @
AEDC-TR-79-57 ..... MBB-14944 @
AEDC-TR-79-67 ..... MBB-14218 @

AEDC-TSR-79-V4 ..... MBB-14194 @

AETE-PR-79/36 ..... MBB-14109 @

AFAPL-TR-79-2026 ..... MBB-14505 @
AFAPL-TR-79-2042 ..... MBB-14506 @

AFESC-TR-2-79 ..... MBB-14063 @

AFESC/ESL-TR-79-20 ..... MBB-14504 @

AFFDL-TR-79-3063 ..... MBB-14853 @
AFFDL-TR-79-3067 ..... MBB-14388 @
AFFDL-TR-79-3068 ..... MBB-14146 @
AFFDL-TR-79-3084 ..... MBB-14145 @

AFGL-AFSG-410 ..... MBB-14186 @

AFGL-SR-217 ..... MBB-14057 @

AFGL-TR-78-0262 ..... MBB-14882 @
AFGL-TR-79-0053 ..... MBB-14057 @
AFGL-TR-79-0089 ..... MBB-14186 @
AFGL-TR-79-0218 ..... MBB-14170 @

AFML-TR-79-4080 ..... MBB-14852 @

AFOSR-79-0607TR ..... MBB-14712 @
AFOSR-79-0609TR ..... MBB-14709 @
AFOSR-79-0911TR ..... MBB-14796 @
AFOSR-79-0951TR ..... MBB-14213 @
AFOSR-79-0954TR ..... MBB-14943 @
AFOSR-79-0955TR ..... MBB-14313 @
AFOSR-79-0956TR ..... MBB-14387 @
AFOSR-79-0959TR ..... MBB-14946 @
AFOSR-79-0960TR ..... MBB-14719 @
AFOSR-79-0969TR ..... MBB-14222 @
AFOSR-79-0983TR ..... MBB-14392 @
AFOSR-79-0985TR ..... MBB-14318 @

AFRPL-TR-78-62 ..... MBB-14190 @
AFRPL-TR-79-8 ..... MBB-14192 @
AFRPL-TR-79-34-VOL-1 ..... MBB-14260 @
AFRPL-TR-79-34-VOL-2 ..... MBB-14261 @

AFRRI-SR-79-1 ..... MBB-14693 @

AGARD-AG-246 ..... MBB-14739 @

AGARD-CP-264-SUPPL ..... MBB-14728 @
AGARD-CP-265 ..... MBB-14678 @
AGARD-CP-272 ..... MBB-14017 @

AGARD-R-686 ..... MBB-14858 @

AGBC-79-001-1 ..... MBB-14389 @

AIAA-PAPER-80-0164 ..... MBB-14843*@

AIRESEARCH-21-3213-1 ..... MBB-14235*@
AIRESEARCH-21-3239 ..... MBB-14417 @

AMA-79-20 ..... MBB-14164*@

AMHERST-0077-VOL-1 ..... MBB-14775 @
AMHERST-0077-VOL-2 ..... MBB-14776 @

ANRL-TR-72-74 ..... MBB-14722 @
ANRL-TR-75-50-VOL-125 ..... MBB-14848 @
ANRL-TR-75-50-VOL-129 ..... MBB-14849 @
ANRL-TR-75-50-VOL-137 ..... MBB-14850 @
ANRL-TR-75-50-VOL-138 ..... MBB-14851 @
ANRL-TR-78-120 ..... MBB-14703 @
ANRL-TR-78-128 ..... MBB-14690 @
ANRL-TR-79-4 ..... MBB-14695 @
ANRL-TR-79-33 ..... MBB-14721 @
ANRL-TR-79-44 ..... MBB-14692 @

ANSAA-TR-279 ..... MBB-14777 @

ANL-78-80 ..... MBB-14365 @

ANL/CES/TE-79-2 ..... MBB-14263 @
ANL/CNSV/TM-2 ..... MBB-14525 @
ANL/EES/TM-38 ..... MBB-14271 @

APL/JHU/GEMS-003 ..... MBB-14578 @
APL/JHU/QM-79-002 ..... MBB-14578 @

AR-2 ..... MBB-14881 @
AR-001-832 ..... MBB-14233 @
AR-001-836 ..... MBB-14670 @
AR-001-838 ..... MBB-14841 @

ARBRL-MR-02930 ..... MBB-14316 @

ARBRL-TR-02170 ..... MBB-14215 @

ARD-830 ..... MBB-14144 @

ARL/PSU/TM-79-132 ..... MBB-14845 @
ARL/PSU/TM-79-135 ..... MBB-14846 @
ARL/PSU/TM-79-139 ..... MBB-14847 @

ARO-13422.1-P ..... MBB-14940 @
ARO-13666.6-MSI ..... MBB-14854 @

ARO-13770.6-EL ..... N80-14320 #
ARO-13970.1-MS ..... N80-14252 #
ARO-14210.1-MS ..... N80-14542 #
ARO-14541.1-EL ..... N80-14324 #

ARPA-QR8 ..... N80-14308 #

ARRO-3034-R79-3 ..... N80-14720 #

ASD-TR-78-21 ..... N80-14061 #
ASD-TR-79-5038 ..... N80-14061 #

ATC-80 ..... N80-14064 #

ATR-78(7747)-1-VOL-1 ..... N80-14550 #
ATR-78(7747)-2-VOL-2 ..... N80-14551 #

AVRADCOM-TR-80-E1 ..... N80-14840*#

AVSD-0082-78-RE ..... N80-14199 #

BDC-RD-1979/19 ..... N80-14286
BDC-RD-1979/21 ..... N80-14287

BDR-4159 ..... N80-14315 #

BCS-40283 ..... N80-14773*#

BDX-613-2060-REV ..... N80-14765 #

BEI-78-761 ..... N80-14191 #

BLR/IR/ES-79/08-VOL-2-A ..... N80-14588 #
BLR/IR/ES-79/09-VOL-2-B ..... N80-14589 #

BMYG-FBWT-79-5 ..... N80-14142 #
BMYG-FBWT-79-07 ..... N80-14799 #

BNL-24662 ..... N80-14890 #
BNL-24818 ..... N80-14897 #
BNL-26188 ..... N80-14586 #
BNL-26218 ..... N80-14552 #
BNL-26238 ..... N80-14522 #
BNL-50959 ..... N80-14512 #

BR70941 ..... N80-14341 #

C-67-03 ..... N80-14402*#

CAA-SR-79-6-VOL-1 ..... N80-14957 #
CAA-SR-79-6-VOL-2-APP-B-ABB-1 ..... N80-14958 #
CAA-SR-79-6-VOL-3-APP-B-ABB-3 ..... N80-14959 #

CABC-36 ..... N80-14272 #
CABC-38-VOL-1 ..... N80-14974 #
CABC-39-VOL-2 ..... N80-14975 #
CABC-300-79-003-VOL-1 ..... N80-14974 #
CABC-300-79-004 ..... N80-14975 #
CABC-500-79-007 ..... N80-14272 #

CALCULON-3050-R ..... N80-14767 #

CALT-63-304 ..... N80-14888 #

CCC-79-126 ..... N80-14217 #

CDC-79-2 ..... N80-14172 #

CEL-CR-79.013 ..... N80-14615 #

CF-5 ..... N80-14109 #

CGR/DC-7/79 ..... N80-14507 #

CISR-R010-7908-02 ..... N80-14965 #
CISR-R010-7908-03 ..... N80-14966 #

CISR-P010-7906-12 ..... N80-14778 #

CISR-TR-2 ..... N80-14965 #
CISR-TR-3 ..... N80-14966 #
CISR-TR-12 ..... N80-14778 #

CNU-CS-79-131 ..... N80-14764 #

CNEXO-16-1978 ..... N80-14667 #

CONF-771131 ..... N80-14572 #
CONF-780236-P1 ..... N80-14555 #
CONF-780236-P2 ..... N80-14553 #
CONF-780236-P3 ..... N80-14554 #
CONF-780372 ..... N80-14264 #
CONF-780383 ..... N80-14558 #
CONF-780550-9 ..... N80-14563 #
CONF-780587-3 ..... N80-14226 #
CONF-780619-25 ..... N80-14564 #
CONF-780688-2 ..... N80-14394 #
CONF-780741-4 ..... N80-14228 #
CONF-780792 ..... N80-14548 #
CONF-780804-14-TRANS ..... N80-14908 #
CONF-780807-11 ..... N80-14265 #
CONF-780808-23 ..... N80-14569 #
CONF-780808-24 ..... N80-14568 #
CONF-780811-32 ..... N80-14924 #
CONF-780834-2 ..... N80-14240 #
CONF-780852-1 ..... N80-14573 #
CONF-781025-3 ..... N80-14897 #
CONF-781033-46 ..... N80-14348 #
CONF-790150-4 ..... N80-14950 #
CONF-790347-10 ..... N80-14895 #
CONF-790356-2 ..... N80-14805 #
CONF-790373-1 ..... N80-14562 #
CONF-790381-1 ..... N80-15016 #
CONF-790413-4 ..... N80-14173*#
CONF-790441-7 ..... N80-14237 #
CONF-790448-1 ..... N80-14907 #
CONF-790459-22 ..... N80-14511 #
CONF-790476-1 ..... N80-15015 #
CONF-790476-2 ..... N80-15014 #
CONF-790481-1 ..... N80-14954 #
CONF-790484-1 ..... N80-14531 #
CONF-790501-2 ..... N80-14538 #
CONF-790506-1 ..... N80-14953 #
CONF-790524-8 ..... N80-14889 #
CONF-790538-10 ..... N80-14530 #
CONF-790541-12 ..... N80-14528 #
CONF-790541-16 ..... N80-14541 #
CONF-790541-17 ..... N80-14540 #
CONF-790541-18 ..... N80-14557 #
CONF-790541-21 ..... N80-14552 #
CONF-790541-32 ..... N80-14527 #
CONF-790541-37 ..... N80-14549 #
CONF-790550-1 ..... N80-14584 #
CONF-790567-1 ..... N80-14506 #
CONF-790611-5 ..... N80-14269 #
CONF-790635-1 ..... N80-14379 #
CONF-790635-3 ..... N80-14420 #
CONF-790646-5 ..... N80-14361 #
CONF-790655-1 ..... N80-14363 #
CONF-790655-2 ..... N80-14347 #
CONF-790707-26 ..... N80-14836 #
CONF-790708-3 ..... N80-14887 #
CONF-790709-1 ..... N80-14856 #
CONF-790713-1 ..... N80-14386 #
CONF-790802-11 ..... N80-14238 #
CONF-790803-06 ..... N80-14893 #
CONF-790803-07 ..... N80-14535 #
CONF-790803-16 ..... N80-14526 #
CONF-790803-29 ..... N80-14522 #
CONF-790819-1 ..... N80-14419 #
CONF-790836-1 ..... N80-15024 #
CONF-7804144-1 ..... N80-14888 #
CONF-7805140 ..... N80-14533 #
CONF-7806108-1 ..... N80-14890 #
CONF-7809137-1 ..... N80-14523 #
CONF-7811126-1 ..... N80-14509 #

CONTRIB-179 ..... N80-14999*#
CONTRIB-180 ..... N80-15000*#

COO-2577-16 ..... N80-14568 #
COO-2858-14 ..... N80-14569 #
COO-2893-10 ..... N80-14524 #
COO-2900-17-VOL-1 ..... N80-14268 #
COO-2917-12 ..... N80-14270 #
COO-4236-3 ..... N80-14364 #
COO-4272-3 ..... N80-14507 #
COO-4628-4-PT-1 ..... N80-14516 #
COO-5002-1 ..... N80-14949 #
COO-5002-2 ..... N80-14948 #
COO-5002-3 ..... N80-14947 #

CRC-1327 ..... N80-14280 #

CRIEC-FRL-385-1 ..... N80-14052*#

CSD-2548-FR-VOL-1 ..... N80-14260 #
CSD-2548-FR-VOL-2 ..... N80-14261 #

CSIR-TWISK-43 ..... N80-14426 #
CSIR-TWISK-45 ..... N80-14808 #
CSIR-TWISK-67 ..... N80-14809 #
CSIR-TWISK-68 ..... N80-14810 #
CSIR-TWISK-69 ..... N80-14829 #
CSIR-TWISK-70 ..... N80-14833 #
CSIR-TWISK-71 ..... N80-14812 #
CSIR-TWISK-72 ..... N80-14811 #
CSIR-TWISK-73 ..... N80-14813 #
CSIR-TWISK-74 ..... N80-14830 #
CSIR-TWISK-75 ..... N80-14806 #
CSIR-TWISK-76 ..... N80-14801 #
CSIR-TWISK-77 ..... N80-14814 #
CSIR-TWISK-78 ..... N80-14805 #
CSIR-TWISK-79 ..... N80-14807 #
CSIR-TWISK-81 ..... N80-14828 #

CU-SPL-78-2 ..... N80-14319 #

CU-TP-135 ..... N80-14804 #
CU-TP-137 ..... N80-14896 #

DCIEM-TR-79-X23 ..... N80-14147 #

DFVLR-FB-ID-151-78/6 ..... N80-14183 #

DFVLR-FB-78-01 ..... N80-14820 #
DFVLR-FB-78-02 ..... N80-14328 #
DFVLR-FB-78-05 ..... N80-14821 #
DFVLR-FB-78-06 ..... N80-14819 #
DFVLR-FB-78-18 ..... N80-14790 #
DFVLR-FB-78-19 ..... N80-14789 #

DLR-FB-77-46 ..... N80-14787 #

DNA-4735F ..... N80-14199 #

DOE/CS-0056 ..... N80-14567 #
DOE/ER-70006-6 ..... N80-14619 #
DOE/ERD-0004 ..... N80-14349 #
DOE/ET-0092 ..... N80-14618 #
DOE/ET-0101 ..... N80-14542 #
DOE/EV-0020 ..... N80-14565 #
DOE/EV-0036 ..... N80-14266 #
DOE/JPL-1012-30 ..... N80-14489*#
DOE/JPL-1012-31 ..... N80-14405*#
DOE/JPL-1012-32 ..... N80-14490*#
DOE/JPL-1012-33 ..... N80-14492*#
DOE/JPL-1060-20 ..... N80-14491*#
DOE/JPL-1060-25 ..... N80-14488*#
DOE/JPL-1060-28 ..... N80-14484*#
DOE/JPL-954328-79/13 ..... N80-14483*#
DOE/JPL-954527-79/10 ..... N80-14486*#
DOE/JPL-954830-78/2 ..... N80-14273*#
DOE/JPL-954878-79/5 ..... N80-14485*#
DOE/JPL-955149-79/1 ..... N80-14482*#
DOE/JPL-955149-79/1-APP ..... N80-14481*#
DOE/NASA/2593-79/11 ..... N80-14493*#
DOE/NASA/2674-75/8 ..... N80-14922*#
DOE/TIC-10119 ..... N80-14494 #
DOE/TIC-10127 ..... N80-14515 #

DOT-RS-803-668 ..... N80-14976 #

DOT-TSC-NHTSA-79-43 ..... N80-14976 #

DRSRI-PC-79-1 ..... N80-14112 #

DSA-116 ..... N80-14302 #

D6-48852 ..... N80-14056*#

E-010 ..... N80-14125*#
E-019 ..... N80-14121*#
E-073 ..... N80-14581*#
E-154 ..... N80-14403*#
E-189 ..... N80-14249*#
E-212 ..... N80-14374*#
E-257 ..... N80-14922*#
E-263 ..... N80-14493*#
E-267 ..... N80-14238*#
E-268 ..... N80-14051*#
E-271 ..... N80-14196*#
E-272 ..... N80-14126*#
E-276 ..... N80-14375*#
E-279 ..... N80-14050*#
E-282 ..... N80-14843*#
E-288 ..... N80-14113*#

E-9467 ..... N80-14123*#
E-9468 ..... N80-14124*#

EDR-9132 ..... N80-14129*#

EGG-1183-5104 ..... N80-14907 #

EISI-TR-4007-2-VOL-1 ..... N80-14212*#

EMD-79-19 ..... N80-14575 #
EMD-79-84 ..... N80-14279 #

EOTPO-46 ..... N80-14902 #
EOTPO-55 ..... N80-14904 #

EPA-430/9-79-007 ..... N80-14597 #
EPA-450/8-79-009 ..... N80-14592 #
EPA-600/3-78-111 ..... N80-14595 #
EPA-600/7-79-019 ..... N80-14696 #
EPA-600/2-79-056 ..... N80-14278 #
EPA-600/2-79-080 ..... N80-14596 #
EPA-600/2-79-092 ..... N80-14967 #
EPA-600/2-79-094 ..... N80-14594 #
EPA-600/8-79-018 ..... N80-14470 #
EPA-600/8-79-075 ..... N80-14676*#
EPA-600/7-79-060A-VOL-1 ..... N80-14463 #
EPA-600/7-79-060B-VOL-2 ..... N80-14464 #
EPA-600/7-79-060C-VOL-3 ..... N80-14465 #
EPA-600/7-79-060D-VOL-4 ..... N80-14466 #
EPA-600/7-79-060E-VOL-5 ..... N80-14467 #
EPA-600/7-79-060F-VOL-6 ..... N80-14468 #
EPA-600/7-79-078 ..... N80-14593 #
EPA-600/7-79-104A ..... N80-14590 #
EPA-600/7-79-104B ..... N80-14591 #

EPRI-EA-1079 ..... N80-14514 #

EPRI-ER-513 ..... N80-14536 #
EPRI-ER-966-SR ..... N80-14560 #
EPRI-ER-1004 ..... N80-14537 #

EPRI-FP-1058 ..... N80-14224 #
EPRI-FP-1061 ..... N80-14239 #
EPRI-FP-1062-VOL-1 ..... N80-14835 #

ERADCOM/ASL-TR-0037 ..... N80-14653 #

ERIM-131500-9-F ..... N80-14458 #

EST-P-5190 ..... N80-14601 #

ESA-RR-01 ..... N80-14677 #

ESA-CR(P)-878-VOL-2 ..... N80-14782 #
ESA-CR(P)-878-VOL-3 ..... N80-14783 #
ESA-CR(P)-1120 ..... N80-14404 #
ESA-CR(P)-1176-VOL-1 ..... N80-14380 #
ESA-CR(P)-1228-VOL-1 ..... N80-14784 #
ESA-CR(P)-1228-VOL-2 ..... N80-14785 #
ESA-CR(P)-1228-VOL-3 ..... N80-14786 #
ESA-CR(P)-1233 ..... N80-14166 #
ESA-CR(P)-1240 ..... N80-14195 #

ESA-PSS-05/QRR-102-ESTEC-ISS-2 ..... N80-14350 #
ESA-PSS-07/QRR-01-ISSUE-5 ..... N80-14187 #
ESA-PSS-48(TTC.C.10)-ISSUE-1 ..... N80-14327 #

ESA-SP-1020 ..... N80-14440 #

ESA-TT-523 ..... N80-14143 #
ESA-TT-529 ..... N80-14787 #
ESA-TT-578 ..... N80-14381 #
ESA-TT-581 ..... N80-14788 #
ESA-TT-593 ..... N80-14328 #
ESA-TT-594 ..... N80-14819 #
ESA-TT-595 ..... N80-14789 #
ESA-TT-596 ..... N80-14820 #
ESA-TT-597 ..... N80-14821 #
ESA-TT-598 ..... N80-14790 #

ESD-TR-79-81 ..... N80-14614 #
ESD-TR-79-163 ..... N80-14309 #
ESD-TR-79-185 ..... N80-14310 #

ESDS-79010 ..... N80-14396

ESL-711847-1 ..... N80-14307 #

ESS/ES-919 ..... N80-14166 #

EUR-5978 ..... N80-14582 #

FAA-RD-78-45 ..... N80-14064 #
FAA-RD-79-49 ..... N80-14633*#
FAA-RD-79-52 ..... N80-14256 #
FAA-RD-79-57 ..... N80-14144 #

FE-2435-32 ..... N80-14258 #

FEMA/NT-79/83-72 ..... N80-14274 #

FR-79-21/AS ..... N80-14184*#

FRD-5 ..... N80-14597 #

FRI-B646/3-VOL-1 ..... N80-14380 #

FUB-11-1979 ..... N80-14065 #
FUB-28 ..... N80-14291 #

GA-A-15228 ..... N80-14421 #

GARP-SPEC-REPT-32 ..... N80-14656 #
GARP-SPEC-REPT-33 ..... N80-14657 #

GDC-BAS-79-002 ..... N80-14197*#

GEAEP-54 ..... N80-14484*#

GEFR-SP-158 ..... N80-14836 #

GIDEP-E123-0600 ..... N80-14308 #
GIDEP-E138-2687 ..... N80-14343 #

GMD-MITT-42 ..... N80-14818 #
GMD-MITT-47 ..... N80-14781 #

GPO-50-404 ..... N80-14970 #
GPO-52-135 ..... N80-14650 #

HAOS-12 ..... N80-14601 #
HAOS-26 ..... N80-14598 #
HAOS-27-VOL-1 ..... N80-14600 #
HAOS-28-VOL-2 ..... N80-14599 #
HAOS-29-VOL-3 ..... N80-14602 #

HCP/CS-0023 ..... N80-14561 #
HCP/T4022-01 ..... N80-14559 #
HCP/T4024-01/15 ..... N80-14566 #
HCP/T5043-01 ..... N80-14510 #

HPP-79-12 ..... N80-14797 #

ICAF-COMP-1979 ..... N80-14422 #

ICAF-1104 ..... N80-14413 #

IPP-78-1 ..... N80-14925 #
IPP-78-5 ..... N80-14926 #
IPP-78-6 ..... N80-14927 #
IPP-78-8 ..... N80-14928 #

IPPJ-32 ..... N80-14917 #
IPPJ-412 ..... N80-14915 #
IPPJ-417 ..... N80-14910 #
IPPJ-418 ..... N80-14914 #
IPPJ-419 ..... N80-14913 #
IPPJ-420 ..... N80-14920 #
IPPJ-421 ..... N80-14916 #
IPPJ-422 ..... N80-14912 #
IPPJ-423 ..... N80-14911 #
IPPJ-424 ..... N80-14919 #
IPPJ-425 ..... N80-14918 #

IS-M-212 ..... N80-14953 #

IS-4693 ..... N80-14200 #

ISBN-0-38-08327-8 ..... N80-14609 #
ISBN-0-85679-254-3 ..... N80-14396
ISBN-0-930978-04-8 ..... N80-14574 #
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ISBN-3-7696-8533-4 ..... N80-14622 #
ISBN-3-7696-8534-2 ..... N80-14461 #
ISBN-92-63-10524-3 ..... N80-14658 #
ISBN-92-63-10528-6 ..... N80-14659 #

ISBN-92-825-0185-X ..... N80-14582 #
ISBN-92-835-0247-7 ..... N80-14017 #
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ISBN-92-835-0250-7 ..... N80-14678 #
ISBN-92-835-0251-5 ..... N80-14728 #
ISBN-92-835-1332-8 ..... N80-14739 #

ISP-2 ..... N80-14222 #

ISSN-0141-4089 ..... N80-14396
ISSN-0306-7874 ..... N80-14631
ISSN-0374-1257 ..... N80-14366 #
ISSN-0378-1257 ..... N80-14367 #
ISSN-0379-6566 ..... N80-14440 #

JIAA-TR-6 ..... N80-14842*#

JPL-PR-42-54 ..... N80-14150*#

JPL-PUB-79-36 ..... N80-14609*#
JPL-PUB-79-46 ..... N80-14211*#
JPL-PUB-79-81 ..... N80-14358*#
JPL-PUB-79-83 ..... N80-14488*#
JPL-PUB-79-91 ..... N80-14675*#
JPL-PUB-79-92 ..... N80-14805*#
JPL-PUB-79-96 ..... N80-14489*#
JPL-PUB-79-102 ..... N80-14490*#
JPL-PUB-79-107 ..... N80-14491*#
JPL-PUB-79-110 ..... N80-14492*#
JPL-PUB-79-119 ..... N80-14956*#

JSC-12564 ..... N80-14180*#
JSC-16221 ..... N80-15012*#
JSC-16232 ..... N80-14772*#

K/ZS-2936 ..... N80-14362 #

L-12854 ..... N80-14136*#
L-13207 ..... N80-14840*#
L-13307 ..... N80-14046*#
L-13308 ..... N80-14257*#
L-13339 ..... N80-14045*#
L-13345 ..... N80-14771*#

LA-UR-79-226 ..... N80-14346 #
LA-UR-79-628 ..... N80-14526 #
LA-UR-79-721 ..... N80-14856 #
LA-UR-79-1116 ..... N80-15015 #
LA-UR-79-1117 ..... N80-15014 #
LA-UR-79-1220 ..... N80-14535 #
LA-UR-79-1240 ..... N80-14893 #
LA-UR-79-1393 ..... N80-14584 #
LA-UR-79-1660 ..... N80-14173*#

LA-7849-MS ..... N80-14817 #
LA-7876-MS ..... N80-14620 #

LBF-S-142 ..... N80-14422 #

LBL-7827 ..... N80-14226 #
LBL-8042 ..... N80-14883 #
LBL-8135 ..... N80-14348 #
LBL-8431 ..... N80-14533 #
LBL-8739 ..... N80-14225 #
LBL-8857 ..... N80-14549 #
LBL-9043 ..... N80-14885 #
LBL-9168 ..... N80-14952 #
LBL-9219 ..... N80-14886 #

LC-78-62956 ..... N80-14574 #

LEC-13945 ..... N80-14772*#

LESC-HEEC-0568850 ..... N80-14358*#

LSI-TR-319-31-6 ..... N80-14718*#

MAB-1233-T2 ..... N80-14342 #

MBB-UF-1446(C) ..... N80-14140 #

MBB-UFE-1443(C) ..... N80-14058 #
MBB-UFE-1447(C) ..... N80-14141 #

MCR-79-632 ..... N80-14132 #
MCR-79-682 ..... N80-14176*#

MDC-G8090 ..... N80-14192 #
MDC-G8261 ..... N80-14179*#

NASSP-79-29 ..... N80-14407 #

NII-R-225 ..... N80-14458 #

NITSO-79/16 ..... N80-14576 #
NITSO-79/17 ..... N80-14625 #

NLR-2419 ..... N80-14570 #
NLR-2625-OP ..... N80-14540 #
NLR-2626-OP ..... N80-14547 #

NPI-FAR/EXTRATERREST-152 ..... N80-14621 #
NPI-FAR/EXTRATERREST-155 ..... N80-15002

NPIS-MITT-66 ..... N80-14366 #
NPIS-MITT-67 ..... N80-14367 #
NPIS-MITT-68 ..... N80-14368 #

NPIS-4/1979 ..... N80-14369 #

NPB-5 ..... N80-14344 #

NRI-142-31 ..... N80-14171 #

NRL-R-752 ..... N80-14233 #
NRL-R-756 ..... N80-14841 #

NRL-IR-420 ..... N80-14670 #

NTP-2-2-812 ..... N80-14905 #

NADC-78193-60 ..... N80-14132 #
NADC-79215-60 ..... N80-14416 #
NADC-79233-60 ..... N80-14378 #

NASA-CASE-ARC-11106-1 ..... N80-14107*

NASA-CASE-GSC-12237-1 ..... N80-14384*
NASA-CASE-GSC-12322-1 ..... N80-14390*
NASA-CASE-GSC-12331-1 ..... N80-14183*

NASA-CASE-LAR-11690-1 ..... N80-14371*

NASA-CASE-LEW-12586-1 ..... N80-14472*
NASA-CASE-LEW-12955-1 ..... N80-14684*
NASA-CASE-LEW-13169-1 ..... N80-14232*#

NASA-CASE-MFS-23284-1 ..... N80-14397*
NASA-CASE-MFS-23720-2 ..... N80-14423*
NASA-CASE-MFS-23727-1 ..... N80-14473*

NASA-CASE-MSC-18106-1 ..... N80-14338*#
NASA-CASE-MSC-18422-1 ..... N80-14400*#

NASA-CASE-NPO-10857-1 ..... N80-14330*
NASA-CASE-NPO-13652-3 ..... N80-14474*
NASA-CASE-NPO-13830-1 ..... N80-14281*
NASA-CASE-NPO-14078-1 ..... N80-14477*
NASA-CASE-NPO-14101-1 ..... N80-14687*
NASA-CASE-NPO-14124-1 ..... N80-14603*
NASA-CASE-NPO-14340-1 ..... N80-14579*
NASA-CASE-NPO-14350-1 ..... N80-14332*
NASA-CASE-NPO-14474-1 ..... N80-14229*

NASA-CASE-ILE-02062-1 ..... N80-14180*

NASA-CASE-INP-08835-1 ..... N80-14395*

NASA-CR-2104 ..... N80-14633*#
NASA-CR-2113 ..... N80-14977*#

NASA-CR-2861 ..... N80-14137*#
NASA-CR-3134 ..... N80-14760*#
NASA-CR-3157 ..... N80-14354*#
NASA-CR-3208 ..... N80-14048*#
NASA-CR-3210 ..... N80-14047*#
NASA-CR-3214 ..... N80-14651*#
NASA-CR-3218 ..... N80-14356*#
NASA-CR-3231 ..... N80-14357*#
NASA-CR-135192 ..... N80-14129*#
NASA-CR-135250 ..... N80-14116*#
NASA-CR-135254 ..... N80-14115*#
NASA-CR-135267 ..... N80-14117*#
NASA-CR-135268 ..... N80-14118*#
NASA-CR-135279 ..... N80-14119*#
NASA-CR-135320 ..... N80-14120*#
NASA-CR-152334 ..... N80-14184*#
NASA-CR-159142 ..... N80-14773*#
NASA-CR-159143 ..... N80-14056*#
NASA-CR-159159 ..... N80-14021*#
NASA-CR-159162 ..... N80-14212*#
NASA-CR-159168 ..... N80-14197*#
NASA-CR-159170 ..... N80-14015*#
NASA-CR-159172 ..... N80-14816*#
NASA-CR-159180 ..... N80-14054*#
NASA-CR-159183 ..... N80-14359*#
NASA-CR-159184 ..... N80-14053*#
NASA-CR-159190 ..... N80-14355*#
NASA-CR-159192 ..... N80-14131*#
NASA-CR-159453 ..... N80-14182*#
NASA-CR-159597 ..... N80-14122*#
NASA-CR-159600 ..... N80-14235*#
NASA-CR-159639 ..... N80-14127*#
NASA-CR-159660 ..... N80-14080*#
NASA-CR-159729 ..... N80-14386*#
NASA-CR-159731 ..... N80-14923*#
NASA-CR-159742 ..... N80-14189*#
NASA-CR-159757 ..... N80-14130*#
NASA-CR-160355 ..... N80-14339*#
NASA-CR-160356 ..... N80-14340*#
NASA-CR-160389 ..... N80-14175*#
NASA-CR-160416 ..... N80-14179*#
NASA-CR-160417 ..... N80-14176*#
NASA-CR-160418 ..... N80-14181*#
NASA-CR-160419 ..... N80-14718*#
NASA-CR-160420 ..... N80-14764*#
NASA-CR-160424 ..... N80-14772*#
NASA-CR-161189 ..... N80-14500*#
NASA-CR-161253 ..... N80-14897*#
NASA-CR-162513 ..... N80-14955*#
NASA-CR-162524 ..... N80-14150*#
NASA-CR-162525 ..... N80-14878*#
NASA-CR-162526 ..... N80-15003*#
NASA-CR-162527 ..... N80-14652*#
NASA-CR-162528 ..... N80-14482*#
NASA-CR-162529 ..... N80-14881*#
NASA-CR-162530 ..... N80-14052*#
NASA-CR-162531 ..... N80-14675*#
NASA-CR-162532 ..... N80-14211*#
NASA-CR-162533 ..... N80-14405*#
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NASA-CR-162538 ..... N80-14487*#
NASA-CR-162539 ..... N80-14956*#
NASA-CR-162540 ..... N80-14490*#
NASA-CR-162541 ..... N80-14492*#
NASA-CR-162542 ..... N80-14486*#
NASA-CR-162543 ..... N80-14485*#
NASA-CR-162544 ..... N80-14484*#
NASA-CR-162545 ..... N80-14185*#
NASA-CR-162546 ..... N80-14491*#
NASA-CR-162547 ..... N80-14489*#
NASA-CR-162548 ..... N80-14358*#
NASA-CR-162549 ..... N80-14173*#
NASA-CR-162554 ..... N80-14814*#
NASA-CR-162555 ..... N80-15011*#
NASA-CR-162556 ..... N80-14842*#
NASA-CR-162557 ..... N80-14791*#
NASA-CR-162558 ..... N80-15025*#
NASA-CR-162559 ..... N80-15013*#
NASA-CR-162560 ..... N80-14879*#
NASA-CR-162562 ..... N80-14900*#
NASA-CR-162564 ..... N80-14250*#

NASA-SP-1049 ..... N80-14681*#
NASA-SP-1051 ..... N80-14257*#

NASA-SP-5983(01) ..... N80-14402*#

NASA-TM-58222 ..... N80-15012*#
NASA-TM-73283 ..... N80-14608*#
NASA-TM-75715 ..... N80-15023*#
NASA-TM-75926 ..... N80-14248*#
NASA-TM-75947 ..... N80-14671*#
NASA-TM-75983 ..... N80-14672*#
NASA-TM-75984 ..... N80-14673*#
NASA-TM-75986 ..... N80-14674*#
NASA-TM-76005 ..... N80-14688*#
NASA-TM-76016 ..... N80-14716*#
NASA-TM-76018 ..... N80-14717*#
NASA-TM-78243 ..... N80-14498*#
NASA-TM-78244 ..... N80-14495*#
NASA-TM-78245 ..... N80-14499*#
NASA-TM-78246 ..... N80-14496*#
NASA-TM-78251 ..... N80-14501*#

NASA-TM-78252 ..... N80-14169*#
NASA-TM-78615 ..... N80-14049*#
NASA-TM-79278 ..... N80-14374*#
NASA-TM-79305 ..... N80-14922*#
NASA-TM-79307 ..... N80-14493*#
NASA-TM-79311 ..... N80-14234*#
NASA-TM-79312 ..... N80-14051*#
NASA-TM-79314 ..... N80-14196*#
NASA-TM-79315 ..... N80-14126*#
NASA-TM-79316 ..... N80-14249*#
NASA-TM-79320 ..... N80-14375*#
NASA-TM-79323 ..... N80-14050*#
NASA-TM-80079 ..... N80-14697*#
NASA-TM-80130 ..... N80-14676*#
NASA-TM-80136 ..... N80-14163*#
NASA-TM-80153 ..... N80-14055*#
NASA-TM-80179 ..... N80-14771*#
NASA-TM-80186 ..... N80-14139*#
NASA-TM-80188 ..... N80-14046*#
NASA-TM-80189 ..... N80-14110*#
NASA-TM-80190 ..... N80-14289*#
NASA-TM-80194 ..... N80-14114*#
NASA-TM-80352 ..... N80-15010*#
NASA-TM-80353 ..... N80-15009*#
NASA-TM-80473 ..... N80-14149*#
NASA-TM-80752 ..... N80-14167*#
NASA-TM-80753 ..... N80-14174*#
NASA-TM-80755 ..... N80-14879*#
NASA-TM-80757 ..... N80-14168*#
NASA-TM-80840 ..... N80-14177*#
NASA-TM-80841 ..... N80-14180*#
NASA-TM-80842 ..... N80-14715*#
NASA-TM-80844 ..... N80-14148*#
NASA-TM-80845 ..... N80-14971*#
NASA-TM-80854 ..... N80-15008*#
NASA-TM-81149 ..... N80-14108*
NASA-TM-81152 ..... N80-14138*#
NASA-TM-81163 ..... N80-14941*#
NASA-TM-81376 ..... N80-14128*#
NASA-TM-81377 ..... N80-14843*#
NASA-TM-81382 ..... N80-14113*#

NASA-TP-1531 ..... N80-14123*#
NASA-TP-1532 ..... N80-14124*#
NASA-TP-1538 ..... N80-14136*#
NASA-TP-1556 ..... N80-14121*#
NASA-TP-1567 ..... N80-14581*#
NASA-TP-1582 ..... N80-14125*#
NASA-TP-1583 ..... N80-14403*#
NASA-TP-1608 ..... N80-14840*#
NASA-TP-1611 ..... N80-14045*#

NRS-GCR-79-182 ..... N80-14767 #

NBS-TN-469 ..... N80-14373 #
NBS-TN-1110 ..... N80-14373 #

NBSIR-79-1609 ..... N80-14244 #
NBSIR-79-1611 ..... N80-14257*#

NCAR/TN-138+STR ..... N80-14831 #

NEPRF-TR-79-05 ..... N80-14666 #

NLR-TR-78131-U ..... N80-14413 #

NNEI-38 ..... N80-14471 #

NOAA-TR-NOS-24 ..... N80-14382 #
NOAA-TR-NOS-26 ..... N80-14668 #

NOAA-79011603 ..... N80-15019 #
NOAA-79011604 ..... N80-15020 #
NOAA-79070908 ..... N80-14382 #
NOAA-79072308 ..... N80-14668 #
NOAA-79072401 ..... N80-14623 #
NOAA-79080803 ..... N80-14661 #
NOAA-79080910 ..... N80-14576 #
NOAA-79080911 ..... N80-14625 #
NOAA-79081308 ..... N80-14624 #
NOAA-79082101 ..... N80-15021 #
NOAA-79082102 ..... N80-15022 #

NORDA-TN-34 ..... N80-14390 #

NRL-MR-4060 ..... N80-14259 #
NRL-MR-4070 ..... N80-14665 #
NRL-MR-4071 ..... N80-14834 #
NRL-MR-4078 ..... N80-14904 #

NRL-8298 ..... N80-14304 #
NRL-8304 ..... N80-14844 #
NRL-8311 ..... N80-14902 #

NSF/RA-780571 ..... N80-14469 #
NSF/RA-790003 ..... N80-14962 #

NSB-8-1 ..... N80-14386*#

NSWC/WOL/TR-78-182 ..... N80-14092 #

NTIS/PS-75/045 ..... N80-14626 #
NTIS/PS-75/681 ..... N80-14626 #
NTIS/PS-76/0698 ..... N80-14626 #
NTIS/PS-77/0815 ..... N80-14626 #
NTIS/PS-78/0916 ..... N80-14626 #
NTIS/PS-79/0909/8 ..... N80-14626 #

NUREG-CR-0668 ..... N80-14223 #

NUC-TR-3665 ..... N80-14343 #

OMERA-ST-1978-1 ..... N80-14381 #
OMERA-ST-1978-8 ..... N80-14780 #

OMERA-ST-12/1931-ST ..... N80-14243 #

OMERA-RTD-1/3127-ST ..... N80-14195 #

OMERA-TR-225 ..... N80-14341 #

OSR-TR-3 ..... N80-14250 #

OPPORTUNITY-BRIEF-15 ..... N80-14576 #
OPPORTUNITY-BRIEF-16 ..... N80-14625 #

ORNL-5431 ..... N80-14242 #

ORNL/TM-6456 ..... N80-14408 #

ORO-5126-69 ..... N80-14895 #

OSD-SEL-5-510X ..... N80-14577 #

OSD-TR-710964-4 ..... N80-14290*#

OSURF-760640/780688 ..... N80-14712 #

PAD-79-69 ..... N80-14961 #

PAPER-77-26.6-REV ..... N80-14595 #

PB-297043/2 ..... N80-14574 #
PB-297882/3 ..... N80-14575 #
PB-297984/7 ..... N80-14470 #
PB-298069/6 ..... N80-14593 #
PB-298077/9 ..... N80-14594 #
PB-298147/0 ..... N80-14469 #
PB-298473/0 ..... N80-14595 #
PB-298535/6 ..... N80-14279 #
PB-298541/8 ..... N80-14577 #
PB-298785/7 ..... N80-14578 #
PB-298815/2 ..... N80-14382 #
PB-298841/5 ..... N80-14976 #
PB-298873/1 ..... N80-14329 #
PB-298876/4 ..... N80-14274 #
PB-298943/2 ..... N80-14767 #
PB-298986/1 ..... N80-14962 #
PB-298991/1 ..... N80-14276 #
PB-298996/0 ..... N80-14592 #
PB-299057/0 ..... N80-14668 #
PB-299077/8 ..... N80-14272 #
PB-299105/7 ..... N80-14974 #
PB-299106/5 ..... N80-14975 #
PB-299151/1 ..... N80-14277 #
PB-299169/3 ..... N80-14275 #
PB-299177/6 ..... N80-14463 #
PB-299178/4 ..... N80-14464 #
PB-299179/2 ..... N80-14465 #
PB-299180/0 ..... N80-14466 #
PB-299181/8 ..... N80-14467 #
PB-299182/6 ..... N80-14468 #
PB-299191/7 ..... N80-14590 #
PB-299192/5 ..... N80-14591 #
PB-299206/3 ..... N80-14278 #
PB-299209/7 ..... N80-14597 #
PB-299228/7 ..... N80-14961 #
PB-299256/8 ..... N80-14723 #

PB-299257/6 ..... N80-14724 #
PB-299260/0 ..... N80-14623 #
PB-299285/7 ..... N80-14967 #
PB-299288/1 ..... N80-14244 #
PB-299291/5 ..... N80-14596 #
PB-299305/3 ..... N80-14725 #
PB-299306/1 ..... N80-14726 #
PB-299307/9 ..... N80-14727 #
PB-299363/2 ..... N80-14831 #
PB-299489/5 ..... N80-14471 #
PB-299583/5 ..... N80-14696 #
PB-299637/9 ..... N80-14681 #
PB-299638/7 ..... N80-14598 #
PB-299647/8 ..... N80-14600 #
PB-299648/6 ..... N80-14599 #
PB-299649/4 ..... N80-14602 #
PB-299686/6 ..... N80-14588 #
PB-299687/4 ..... N80-14589 #
PB-299851/6 ..... N80-14576 #
PB-299960/5 ..... N80-14625 #
PB-300298/7 ..... N80-14661 #
PB-300836/4 ..... N80-15021 #
PB-300837/2 ..... N80-15022 #
PB-300863/8 ..... N80-14624 #
PB-300877/8 ..... N80-15019 #
PB-300878/6 ..... N80-15020 #

PBL-2379 ..... N80-14223 #
PBL-2538 ..... N80-14655 #
PBL-2728 ..... N80-14227 #
PBL-2935 ..... N80-14534 #

POLY-EE79-056 ..... N80-14324 #

PP-79-165 ..... N80-14895 #

PPPL-1558 ..... N80-15024 #

PR-1 ..... N80-14236 #
PR-79-1 ..... N80-15025*#
PR-326 ..... N80-15023*#
PR-402 ..... N80-15017 #
PR-483 ..... N80-15018 #
PR-488 ..... N80-15007 #
PR-501 ..... N80-14929 #

PRL-TR-8 ..... N80-14664 #

PT-79-066 ..... N80-14895 #
PT-5459 ..... N80-14344 #

PUBL-369 ..... N80-14201 #
PUBL-379 ..... N80-14255 #
PUBL-597 ..... N80-14370 #
PUBL-598 ..... N80-14060 #

P79-10182 ..... N80-14968*
P79-10183 ..... N80-14969*
P79-10188 ..... N80-14479*#
P79-10189 ..... N80-15008*#
P79-10190 ..... N80-14167*#
P79-10191 ..... N80-14148*#
P79-10192 ..... N80-14149*#
P79-10193 ..... N80-15009*#
P79-10194 ..... N80-15010*#
P79-10195 ..... N80-14168*#
P79-10196 ..... N80-14170*#

QR-8 ..... N80-14258 #

R-138 ..... N80-14901 #
R-1235 ..... N80-14906 #

RADC-TR-79-52-VOL-1 ..... N80-14775 #
RADC-TR-79-52-VOL-2 ..... N80-14776 #
RADC-TR-79-56 ..... N80-14323 #
RADC-TR-79-61 ..... N80-14321 #
RADC-TR-79-68 ..... N80-14891 #
RADC-TR-79-96 ..... N80-15004 #
RADC-TR-79-149 ..... N80-14393 #
RADC-TR-79-166 ..... N80-14302 #
RADC-TR-79-178 ..... N80-14317 #
RADC-TR-79-185-VOL-1 ..... N80-14761 #
RADC-TR-79-185-VOL-2 ..... N80-14762 #
RADC-TR-79-190 ..... N80-14901 #
RADC-TR-79-201 ..... N80-14342 #

RAE-LIB-TRANS-1897 ..... N80-14341 #

RAE-TR-2009 ..... N80-14360 #
RAE-TR-2021 ..... N80-14376 #

RAND/R-1250-ARPA ..... N80-14779 #

REPT-13-78 ..... N80-14326 #
REPT-16 ..... N80-14216 #
REPT-55/1977 ..... N80-14609 #
REPT-79-2 ..... N80-14060 #
REPT-79-5 ..... N80-14370 #
REPT-79SDR2310 ..... N80-14181*#
REPT-270 ..... N80-14325 #
REPT-271 ..... N80-14792 #
REPT-272 ..... N80-14793 #
REPT-273 ..... N80-14794 #
REPT-274 ..... N80-14459 #
REPT-275 ..... N80-14766 #
REPT-1552-11-2-2015 ..... N80-14345 #
REPT-1727-04-1-1959 ..... N80-14106 #
REPT-08699-000-80-VOL-2-A ..... N80-14588 #
REPT-08699-000-80-VOL-2-B ..... N80-14589 #

RLO-2229-T6-6 ..... N80-14619 #

RR78/30107 ..... N80-15026 #

RR-21 ..... N80-14706 #
RR-22 ..... N80-14707 #
RR-24 ..... N80-14710 #
RR-25 ..... N80-14708 #
RR-79-72 ..... N80-14274 #
RR-156 ..... N80-14774 #

R75ARG504 ..... N80-14115*#
R76ARG195 ..... N80-14117*#
R76ARG228 ..... N80-14118*#
R77ARG474-VOL-2 ..... N80-14120*#
R77ARG2122-VOL-2 ..... N80-14116*#
R78ARG206 ..... N80-14119*#
R79-1 ..... N80-14796 #
R79-3 ..... N80-14357*#
R79ARG366 ..... N80-14127*#
R79ARG625 ..... N80-14122*#

SAI-80-926-W/A ..... N80-14855 #

SAND-78-1600C ..... N80-14557 #
SAND-78-2094C ..... N80-14527 #
SAND-78-2123C ..... N80-14420 #
SAND-78-8207 ..... N80-14241 #
SAND-79-0470 ..... N80-14513 #
SAND-79-0997C ..... N80-14538 #
SAND-79-8033 ..... N80-14532 #
SAND-79-8034 ..... N80-14556 #

SAPR-3 ..... N80-14491*#

SC5111.16FR ..... N80-14903 #

SFIS-79/1 ..... N80-14574 #

SER-B-234 ..... N80-14460 #
SER-B-235 ..... N80-14622 #
SER-B-236 ..... N80-14461 #

SER-1-ORIGINAL-REPT-76 ..... N80-14462 #

SERI/TP-34-089 ..... N80-14546 #
SERI/TP-35-279 ..... N80-14269 #
SERI/TP-61-144 ..... N80-14547 #
SERI/TP-62-113 ..... N80-14548 #
SERI/TR-36-110 ..... N80-14617 #
SERI/TR-51-159 ..... N80-14520 #
SERI/TR-51-163 ..... N80-14519 #
SERI/TR-51-194 ..... N80-14518 #

SGD-412-PT-1 ..... N80-15019 #
SGD-412-PT-2 ..... N80-15020 #
SGD-419-PT-1 ..... N80-15021 #
SGD-419-PT-2 ..... N80-15022 #

SLAC-PUB-2296 ..... N80-14950 #

SLAC-TN-79-3 ..... N80-14798 #

SOLAR/0811-79/01 ..... N80-14539 #

SRI-MP-79-54 ..... N80-14213 #

SSRI-RR-78-2 ..... NBS-14698 *
SSRI-RR-78-4 ..... NBS-14699 *
SSRI-RR-78-5 ..... NBS-14700 *
SSRI-RR-78-6 ..... NBS-14701 *
SSRI-RR-78-7 ..... NBS-14702 *

STC-78/376 ..... NBS-14404 *

STI-1037-5 ..... NBS-14719 *

SB-CBR-79-4 ..... NBS-14942 *

SU-STAN-CS-79-742 ..... NBS-14797 *

TD-3 ..... NBS-14709 *

TID-28840-DRAFT ..... NBS-14508 *
TID-28843-DRAFT ..... NBS-14544 *
TID-28844-DRAFT ..... NBS-14543 *
TID-28852-DRAFT ..... NBS-14521 *
TID-28856-DRAFT ..... NBS-14545 *
TID-28858-DRAFT ..... NBS-14972 *
TID-29094 ..... NBS-14478 *

TN-1979-31 ..... NBS-14309 *
TN-1979-34 ..... NBS-14310 *

TOP-2-2-812 ..... NBS-14905 *
TOP-7-3-519 ..... NBS-14377 *

TR-3 ..... NBS-14418 *
TR-4 ..... NBS-14705 *
TR-6 ..... NBS-14221 *
TR-7 ..... NBS-14220 *
TR-8 ..... NBS-14251 *
TR-9 ..... NBS-14502 *
TR-22 ..... NBS-14219 *
TR-41 ..... NBS-14804 *
TR-76-2 ..... NBS-14713 *
TR-79-076 ..... NBS-14895 *
TR-011 ..... NBS-14880 *

TRW-30584-6003-RU-00 ..... NBS-14048**

UCID-18171 ..... NBS-14857 *
UCID-18211 ..... NBS-14267 *

UCLA-ENG-7937 ..... NBS-14314 *

UCRL-TRANS-11428 ..... NBS-14908 *

UCRL-50046-77 ..... NBS-14529 *
UCRL-52546 ..... NBS-14571 *
UCRL-52688 ..... NBS-14253 *
UCRL-52699 ..... NBS-14585 *
UCRL-52773-VOL-1 ..... NBS-14973 *
UCRL-81605 ..... NBS-14379 *
UCRL-82594 ..... NBS-14419 *
UCRL-82721 ..... NBS-14528 *
UCRL-82889 ..... NBS-14887 *

UDR-TR-79-35 ..... NBS-14504 *

UDSE-TR-79-02 ..... NBS-14504 *

UIUCDCS-R-79-998 ..... NBS-14791**

UNICH-HSRI-79-5-1-VOL-1 ..... NBS-14725 *
UNICH-HSRI-79-5-2-VOL-2 ..... NBS-14726 *
UNICH-HSRI-79-5-3-VOL-3 ..... NBS-14727 *
UNICH-HSRI-79-7-1 ..... NBS-14723 *
UNICH-HSRI-79-7-2 ..... NBS-14724 *

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US-PATENT-APPL-SN-102593 ..... NBS-14400**
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US-PATENT-APPL-SN-943088 ..... NBS-14183*
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US-PATENT-CLASS-29-572 ..... NBS-14474*
US-PATENT-CLASS-29-588 ..... NBS-14474*
US-PATENT-CLASS-29-627 ..... NBS-14474*
US-PATENT-CLASS-60-203 ..... NBS-14188*
US-PATENT-CLASS-60-259 ..... NBS-14188*
US-PATENT-CLASS-73-12 ..... NBS-14423*
US-PATENT-CLASS-73-82 ..... NBS-14423*
US-PATENT-CLASS-73-655 ..... NBS-14371*
US-PATENT-CLASS-73-661 ..... NBS-14371*
US-PATENT-CLASS-126-438 ..... NBS-14473*
US-PATENT-CLASS-126-442 ..... NBS-14473*
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US-PATENT-CLASS-210-57 ..... NBS-14579*
US-PATENT-CLASS-210-63Z NBS-14579*
US-PATENT-CLASS-210-321B NBS-14687*
US-PATENT-CLASS-204-161 ..... NBS-14398*
US-PATENT-CLASS-250-281 ..... NBS-14877*
US-PATENT-CLASS-250-282 ..... NBS-14877*
US-PATENT-CLASS-250-310 ..... NBS-14332*
US-PATENT-CLASS-250-423P NBS-14877*
US-PATENT-CLASS-250-492A NBS-14332*
US-PATENT-CLASS-269-156 ..... NBS-14398*
US-PATENT-CLASS-294-86R NBS-14398*
US-PATENT-CLASS-294-113 ..... NBS-14398*
US-PATENT-CLASS-307-63 ..... NBS-14472*
US-PATENT-CLASS-307-66 ..... NBS-14472*
US-PATENT-CLASS-315-145 ..... NBS-14330*
US-PATENT-CLASS-315-240 ..... NBS-14330*
US-PATENT-CLASS-315-334 ..... NBS-14330*
US-PATENT-CLASS-323-15 ..... NBS-14472*
US-PATENT-CLASS-323-19 ..... NBS-14472*
US-PATENT-CLASS-324-150T NBS-14332*
US-PATENT-CLASS-331-94.5C NBS-14384*
US-PATENT-CLASS-331-94.5P NBS-14384*
US-PATENT-CLASS-333-81R NBS-14281*
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US-PATENT-CLASS-343-100SE NBS-14603*
US-PATENT-CLASS-343-112D NBS-14603*
US-PATENT-CLASS-343-880 ..... NBS-14183*
US-PATENT-CLASS-343-883 ..... NBS-14183*
US-PATENT-CLASS-343-909 ..... NBS-14281*
US-PATENT-CLASS-350-295 ..... NBS-14473*
US-PATENT-CLASS-350-296 ..... NBS-14473*
US-PATENT-CLASS-414-1 ..... NBS-14398*
US-PATENT-CLASS-415-199 ..... NBS-14107*
US-PATENT-CLASS-416-228 ..... NBS-14107*
US-PATENT-CLASS-416-238 ..... NBS-14107*
US-PATENT-CLASS-422-9 ..... NBS-14579*
US-PATENT-CLASS-423-149 ..... NBS-14229*
US-PATENT-CLASS-423-293 ..... NBS-14229*
US-PATENT-CLASS-423-348 ..... NBS-14229*
US-PATENT-CLASS-423-417 ..... NBS-14229*
US-PATENT-CLASS-423-625 ..... NBS-14229*

US-PATENT-3,352,774 ..... NBS-14395*
US-PATENT-3,635,537 ..... NBS-14330*
US-PATENT-4,040,940 ..... NBS-14397*
US-PATENT-4,094,775 ..... NBS-14687*
US-PATENT-4,133,697 ..... NBS-14474*
US-PATENT-4,157,655 ..... NBS-14423*
US-PATENT-4,157,718 ..... NBS-14684*
US-PATENT-4,158,775 ..... NBS-14877*
US-PATENT-4,164,718 ..... NBS-14281*
US-PATENT-4,168,939 ..... NBS-14107*
US-PATENT-4,170,776 ..... NBS-14603*
US-PATENT-4,171,615 ..... NBS-14188*
US-PATENT-4,171,645 ..... NBS-14371*
US-PATENT-4,172,228 ..... NBS-14332*
US-PATENT-4,172,786 ..... NBS-14579*
US-PATENT-4,172,883 ..... NBS-14229*
US-PATENT-4,173,001 ..... NBS-14384*
US-PATENT-4,173,324 ..... NBS-14398*

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US-PATENT-4,175,249 ..... PB80-144723*
US-PATENT-4,176,360 ..... PB80-141831*

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USARIEM-M-24/79 ..... PB80-146911 #

USATTC-7901 ..... PB80-144061 #

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USC-001922-4-T ..... PB80-146991 #
USC-001922-5-T ..... PB80-147001 #
USC-001922-6-T ..... PB80-147011 #
USC-001922-7-T ..... PB80-147021 #

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WHO-364 ..... PB80-146601 #
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